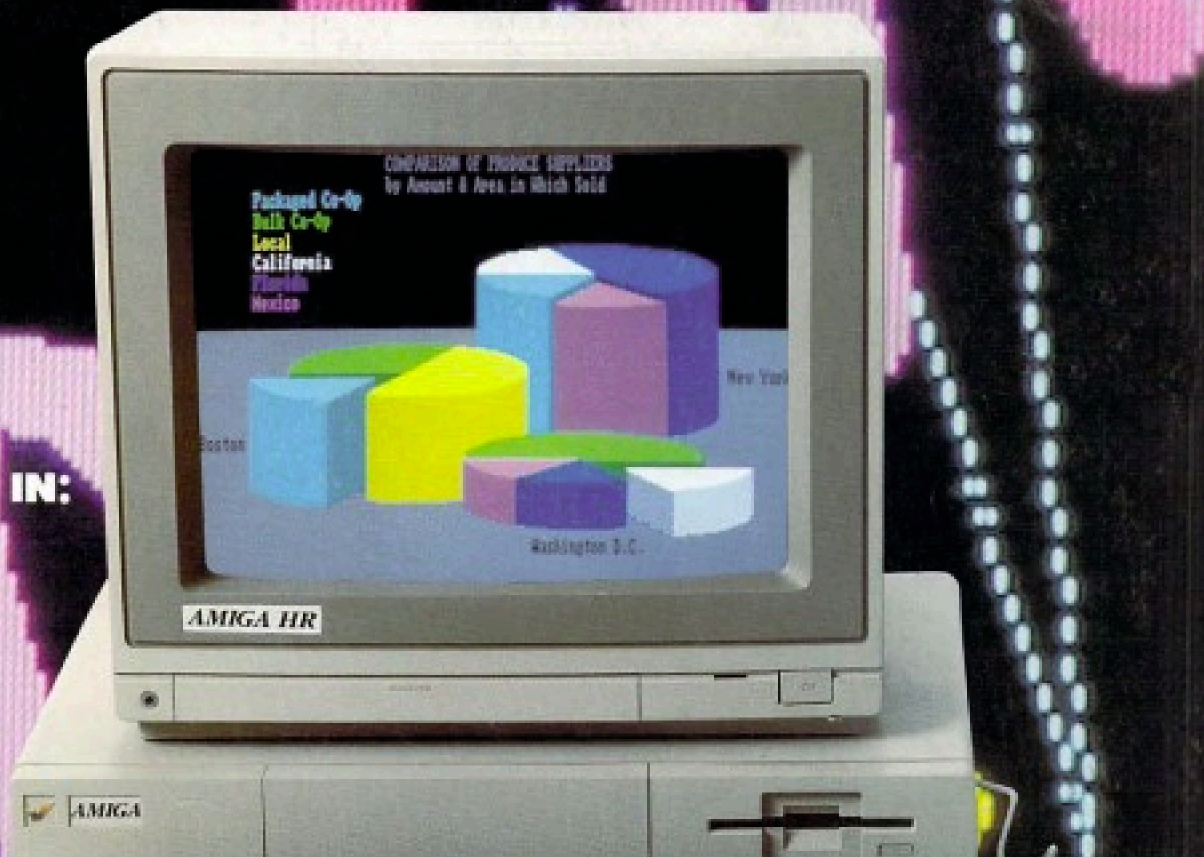
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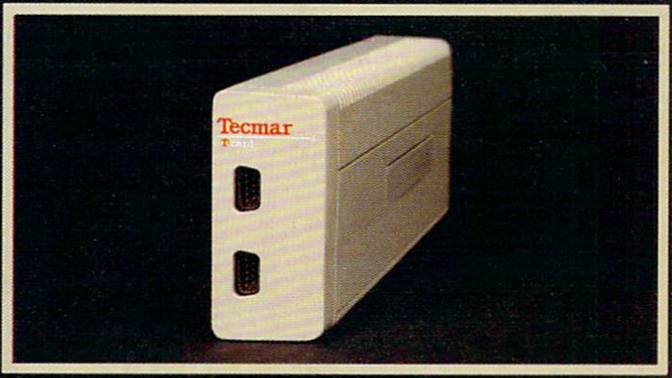
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Volume 1, Number 1, **Premiere** *1985*

Features

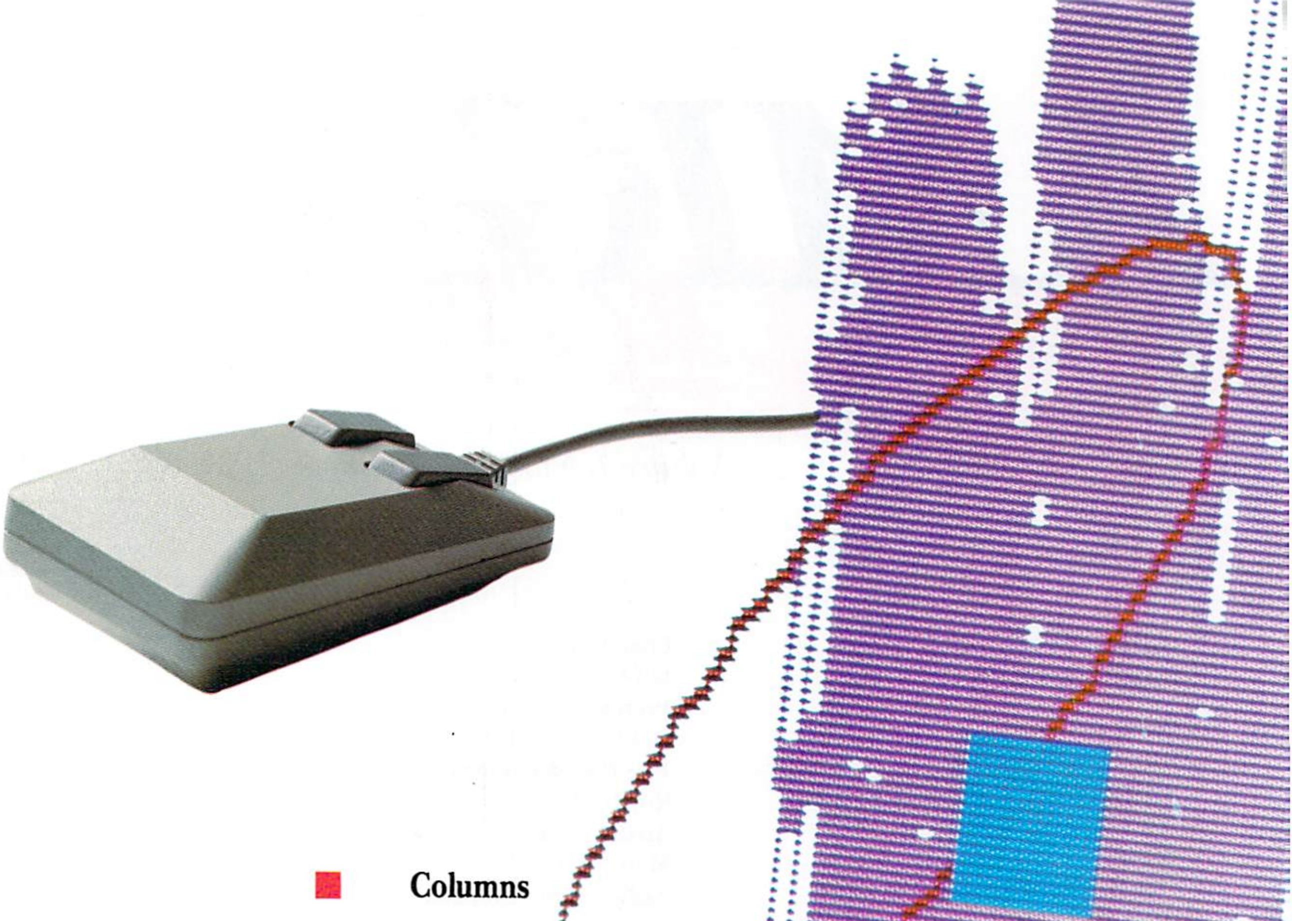




14 **A First Look at the Amiga**
By Margaret Morabito
Margaret Morabito answers the question "Just what is an Amiga, anyway?" in this comprehensive article that outlines the many features of the Amiga, giving you an overview of this remarkable new computer.

36 **What If. . .**
By Guy Wright
The Amiga is going to open new worlds of computer wonder—it is just a matter of time before the Amiga turns "what if" into "what is."

44 **Amazing Graphics**
Sit back, strap yourself in and prepare to be dazzled! This graphics spread will show you just some of the Amiga's graphics capabilities. It's a visual banquet that will leave you craving for more.



Articles

56 **Stimulating Simulations: Electronic Arts Gets Involved with the Amiga**
By Jim Forbes
A look inside Electronic Arts, a renowned software developer with plenty of creative talent and vision, plus a chat with company president Trip Hawkins.

72 **Sounds Like**
By Guy Wright
This article will play for you the opening bars of an Amiga symphony that should bring down the house.

76 **A Peek at the 68000**
By Brian Epstein
This article takes a look at the heart of the Amiga computer—the Motorola 68000 chip.

81 **The Amiga as a Teaching Tool**
By Guy Wright
The Amiga will enhance and enliven the learning process for a new generation of students—and not just in the classroom.

Columns

8 **Avision**
Publisher Stephen Twombly talks about the genesis of *AmigaWorld*.

10 **Zeitgeist**
Hello, this is your editor speaking, with thoughts on a new world of computing.

26 **Amiga Solutions**
AmigaWorld's resident doubting Thomas gets his first look at the new machine.

Departments

64 **Digital Canvas**
Amiga artist Jack Haeger shows what can be done with an Amiga, a mouse and a lot of creative talent.

86 **Help Key**
Questions about the Amiga, answered by the experts.

90 **List of Software**
Software packages available (and some to be released soon) for the Amiga.

96 **Coming Next Issue**

AMIGA WORLD

Volume 1, Number 1, ***Premiere*** *1985*

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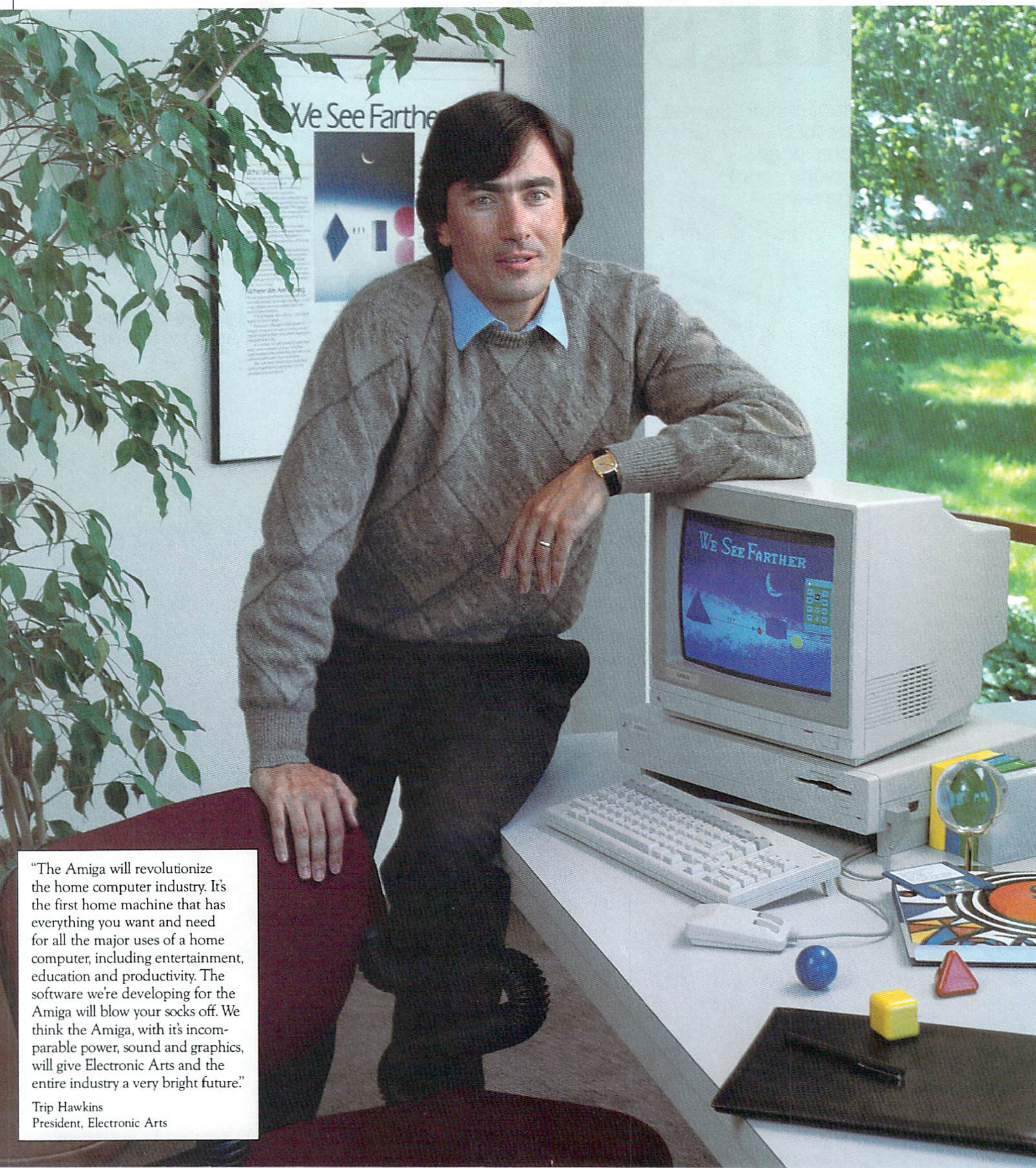
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In our first two years, Electronic Arts has emerged as a leader of the home software business. We have won the most product quality awards—over 60. We have placed the most *Billboard* Top 20 titles—12. We have also been consistently profitable in an industry beset by losses and disappointments.

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We believe that one day soon the home computer will be as important as radio, stereo and television are today.

These electronic marvels are significant because they bring faraway places and experiences right into your home. Today, from your living room you can watch a championship basketball game, see Christopher Columbus sail to the New World, or watch a futuristic spaceship battle.

The computer promises to let you do much more. Because it is interactive you get to participate. For example, you can play in that basketball game instead of just watching. You can actually be Christopher Columbus and feel firsthand what he felt when he sighted the New World. And you can step inside the cockpit of your own spaceship.

But so far, the computer's promise has been hard to see. Software has been severely limited by the abstract, blocky shapes and rinky-dink sound reproduction of most home computers. Only a handful of pioneers have been able to appreciate the possibilities. But then, popular opinion once held that television was only useful for civil defense communications.

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The Amiga is advancing our medium on all fronts. For the first time, a personal computer is providing the visual and aural quality our sophisticated eyes and ears demand. Compared to the Amiga, using some other home computers is like watching black and white television with the sound turned off.

The first Amiga software products from Electronic Arts are near completion. We suspect you'll be hearing a lot about them. Some of them are games like you've never seen before, that get more out of a computer than other games ever have. Others are harder to categorize, and we like that.

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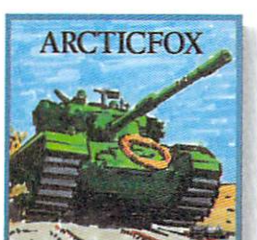
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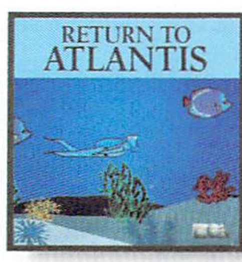
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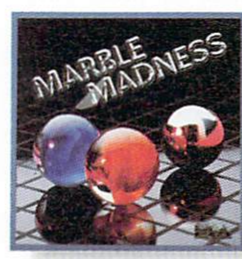
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Avision

By Steve Twombly

In December of 1984, I had my first look at an Amiga prototype at the company's headquarters in Los Gatos, CA. Although the Amiga was still unfinished, I was given a demonstration of its sound and graphics capabilities. I was overwhelmed. When I learned what features were yet to come for business users and what this new machine would retail for, I was convinced it would be the most advanced microcomputer to come on the market in 1985 and 1986.

The developers at Amiga had been working on this new micro for more than two years before I saw the prototype. They had been propelled by a vision that a supermicro could be built and delivered in high volume at an unprecedented low price. They wanted to create a supermicro that would fully exploit the capabilities of Motorola's 68000 microprocessor and stimulate the consumer marketplace. The Amiga was designed to create new markets and reach new consumers.

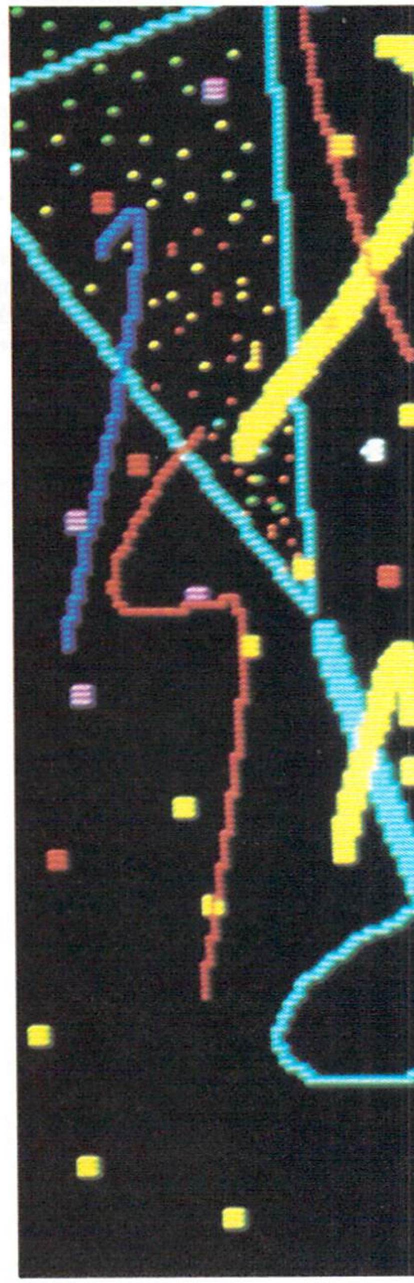
For me, the Amiga vision became a compelling urge to bring to market a dedicated publication that would feature this astounding computer. Immediately, a small team of us began to conceive a new magazine to cover the Amiga. We were all of one mind: Because the Amiga is a unique machine, it needs an equally unique magazine. *AmigaWorld* lives up to that billing.

Software developers, too, were impressed with the new Amiga. They saw the opportunity to develop on the Amiga the most advanced and exciting software imaginable. Some of their products are now available and many are yet to come, but their enthusiasm is typical of that found at Amiga headquarters, Commodore and here at CW/Peterborough.

The new Amiga will become a necessity in a variety of markets. It will be a powerhouse for running business applications due to its incredible speed, easily expandable memory and multitasking capability. As a creativity and productivity tool, the Amiga is unsurpassed and will be frequently used in performing spreadsheet, database, graphics and word processing applications. The development of integrated and "expert" software programs will reach new horizons with the Amiga. The Amiga's range of capabilities is so broad that it will become a critical addition to specialized professions, such as architecture, advertising, CAD (computer-aided design), marketing, film and video, music and many more.

Both the professional and home user will find it easy to create software that takes full advantage of Amiga's amazing speed, graphics, animation and sound. When you add this to the multi-tasking DOS and user interface with overlapping windows, the variable color and screen resolutions, icons and pop-down menus, you have a computer with programming capabilities unlike any other.

The Amiga was designed with the future in mind. Its philosophy is expandability with continuity. The microprocessor can be upgraded, as can the custom chips. The Amiga's memory is expandable without affecting its design. Its open architecture and multi-tasking DOS will open new dimensions in third-





party development of both peripherals and software. As a result, the Amiga will grow over the next five years without losing software and peripheral compatibility, and users need not fear obsolescence.

Amiga makes real what had previously been only a vision in the microcomputing world. Before the Amiga, such power, speed, sound, color and animation capabilities weren't commercially available for under $20,000. Now, everyone will have an opportunity to experience this computing breakthrough. We at *AmigaWorld* believe this opportunity will provide a great deal of excitement for many years to come. As you look through and read the pages of *AmigaWorld*, I think you'll see what I mean.

As we explore the Amiga, remember that this first issue provides only a glimpse of what is to come. The future is here.

Zeitgeist

By Guy Wright

AmigaWorld. Whew! It has been quite an effort putting together a new magazine for a new machine that wasn't even finished at the time we went to press. The official word that we were definitely doing a magazine didn't come through until the beginning of May (roughly a month after the time we should have had all the articles typeset and ready to send to the printer). That meant a lot of scrambling around, a lot of digging, a lot of weekends, late nights, last-minute plane trips to California, New York, Pennsylvania, Illinois and enough phone calls to give us all cauliflower ears.

In many ways, starting up a magazine is pretty close to what you might imagine it would be. The frantic pace, the cups of cold coffee, the stories coming in late, the last-minute decisions, the telephone reports from the coast and the thousands of details that have to be tended to. But I am certain you would be more than a bit surprised if you came up here, to the hills of southwestern New Hampshire, and saw the offices and met the people behind *AmigaWorld*.

There is no steel and glass, no 40-story office building with hundreds of frenetic reporters and grumpy editors. No copyboys dashing around with last-minute stories. There aren't dozens of clacking typewriters or smoke-filled rooms, and the phones only ring 90 percent of the time. Instead, we have a converted New England farmhouse with wooden floors. There's a handful of editors and a few writers, many of whom work at home and send in their stories via modems or word processors and printers. It's a curious mixture of country and technology.

But the key to *AmigaWorld* is the people who did all the running around, word processing, telephoning, designing, editing, typesetting, organizing and so on. There are also quite a number of people not on the *AmigaWorld* staff who helped make this first issue possible. The people at Commodore-Amiga who let us come and see the machine before it was ready, who answered our questions, who did the interviews when they didn't really have time to spare, who stayed up late waiting for calls or got up extra early because of the three-hour time-zone difference between California and New Hampshire, who answered our questions, who helped get the right screen shots, who helped us get in touch with the right people, who photocopied stacks of material and then did it again when something was changed, and who answered still more questions.

We asked a lot of questions. A *lot* of questions. We hope we asked about the things you are interested in. (But if we haven't, then you can always write to us and we'll try and get the kinds of answers you're seeking.) There are still thousands of questions that we haven't asked yet and thousands of pages of information yet to be printed.

But our whole job wasn't and isn't just asking questions. We have to take those questions and turn them into articles that make sense. Distill the information and transform it into something meaningful. Our goal is to provide you with useful, entertaining, understandable information and ideas. Articles that reveal the inner workings of the Amiga from Commodore without a confusing array of techno-talk. Just as you shouldn't have to know how to rebuild a carburetor to drive a car, you shouldn't need a degree in computer science or mathematics to use the power and versatility of the computer.

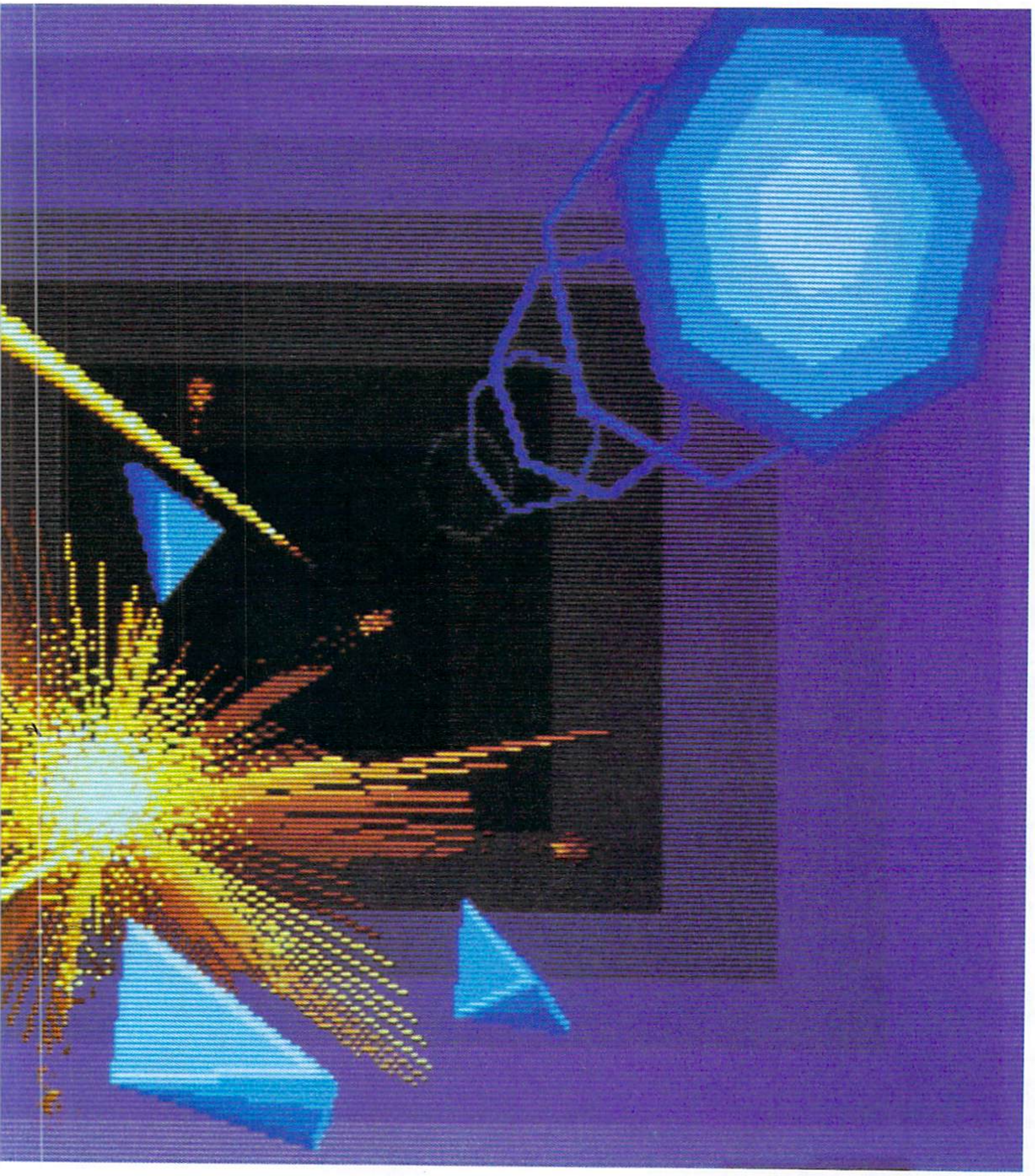
At the same time, we know that you are probably above average in intelligence (after all, you're reading this magazine, aren't you?) and don't need to be spoon-fed. Computers are not simple machines, but neither are they incomprehensible. And while the focus of *AmigaWorld* is (oddly enough) the Amiga computer, we'll be going far beyond dissecting the machine.

We will explore the ways an Amiga can be used for enhancing life; for increasing productivity in business, school and home; for bringing out creativity in music, graphics and even business; for saving you money and time; for amusement; for education; for communication; and for the thousands of things no one has thought of yet. The things that *you* will be thinking about.

That's the exciting thing about the Amiga computer. It is



Illustration by Jack Haeger

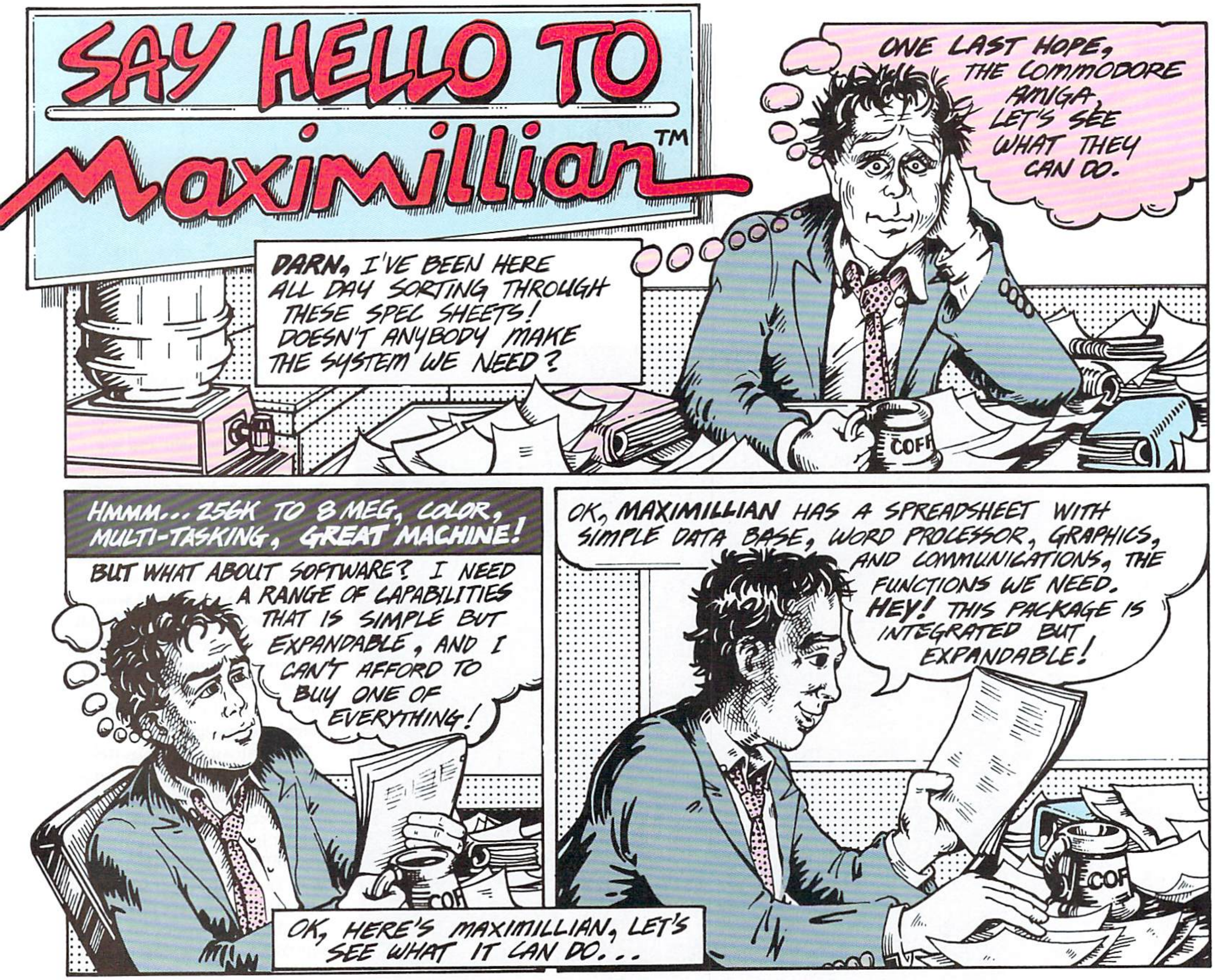


a catalyst for the future of computing. A tool that will bring us into the next age. And the best ideas are going to come from the people who own and use the computer every day. That is the challenge I put to you now. Do something with your Amiga that is the very best ever done. Whatever it is. We are going to be putting out the best magazine we can, to let you know what others are doing with their Amigas and to let others know what you are doing with yours. Do your best, because now there is a machine that can match your imagination.

This first issue of *AmigaWorld* will look into the future a little. Rather than detailing the various commands and specifics, we'll sit back and let the Amiga show off a little. We will focus on its capabilities and what they will mean to you. We'll tell you a bit about its power and versatility. But, with any new project, there will be last-minute changes and alterations, so let me apologize right now for any inaccuracies in this first issue.

The things we will show you and tell you about the Amiga will convince even the most adamant cynic that the Amiga computer is the next wave, and we're all bound to get a little wet. There is no other computer I would rather be involved with and no other magazine. Welcome to *AmigaWorld*.

I would also like to give a special thanks to the entire staff of *RUN* magazine for their patience and invaluable assistance.



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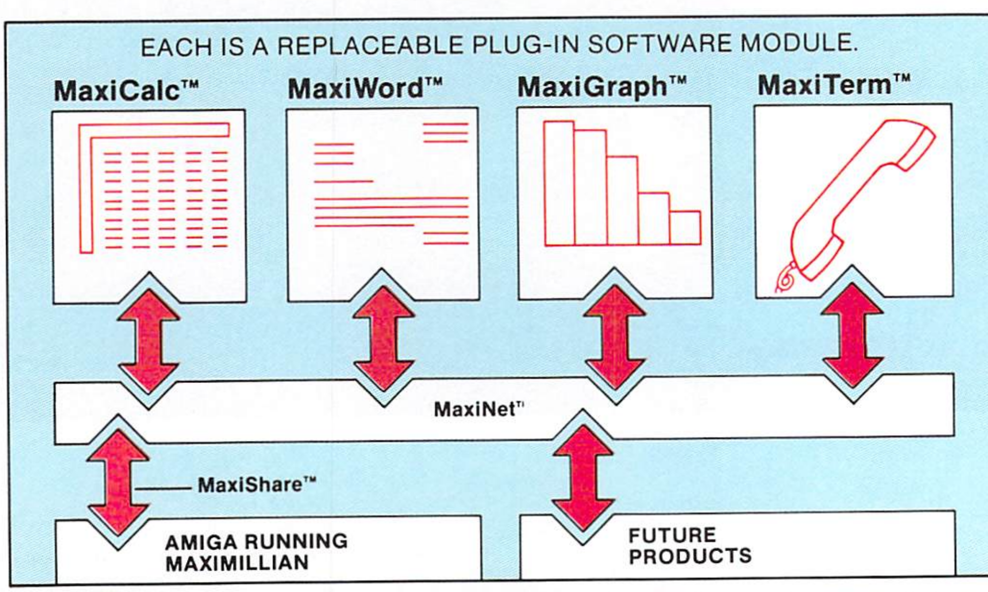
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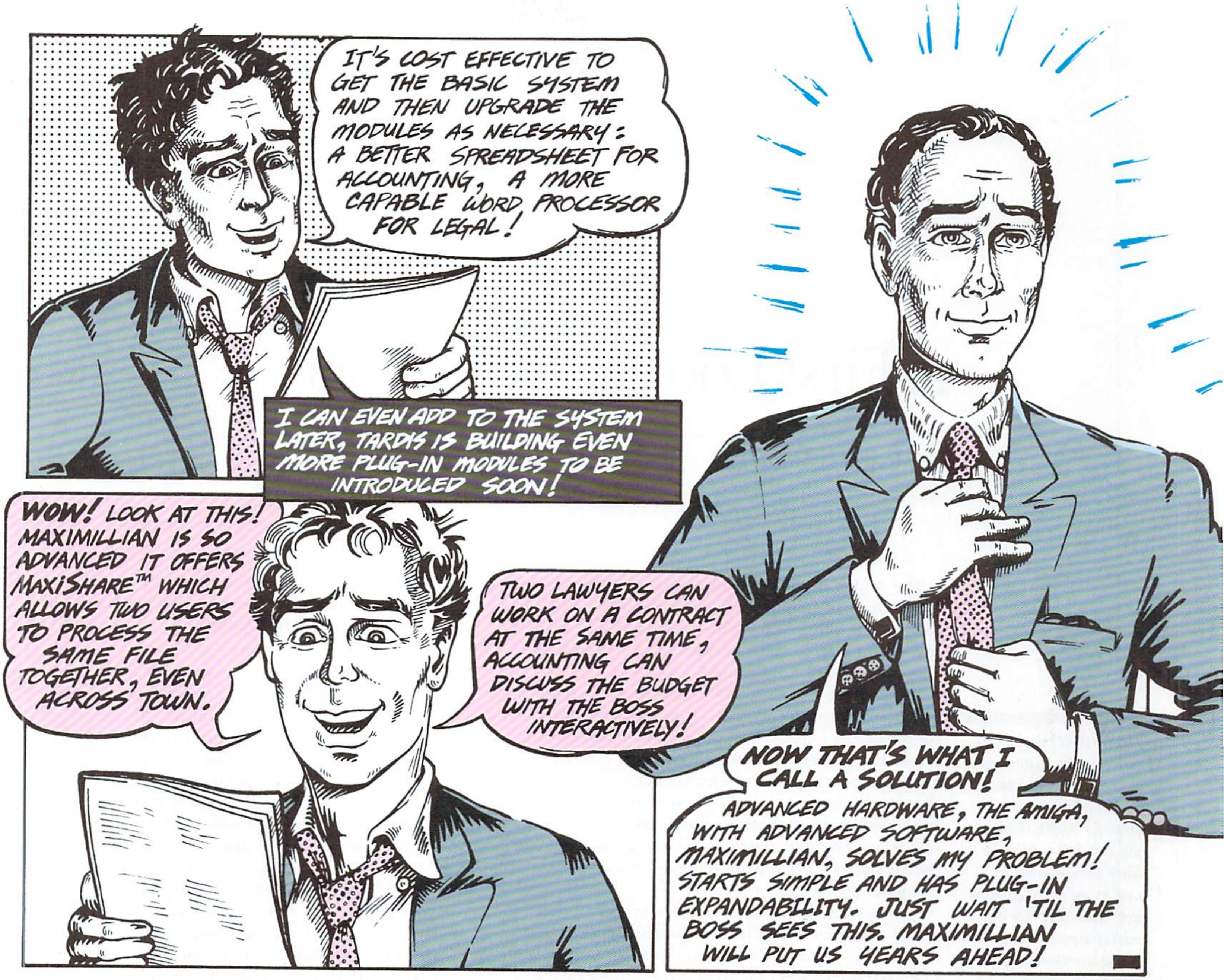
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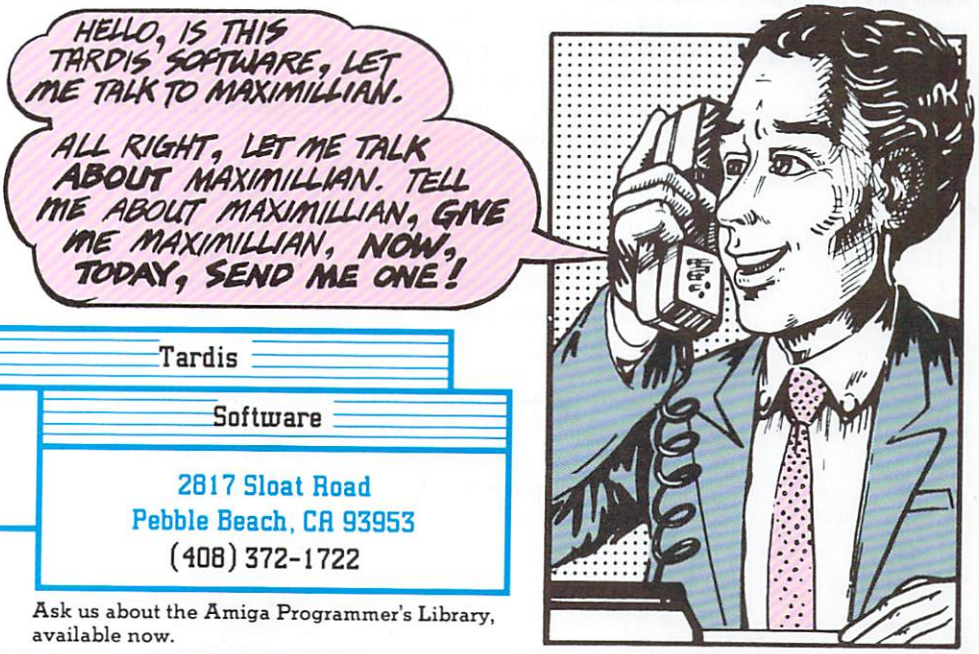
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A First Look at the Amiga

By Margaret Morabito

The Custom graphics chip and the custom animation chip make possible the Amiga's superior graphics output, which you can fully utilize on a home television set as well as on an RGB monitor. Also available are multidimensional displays, selection of up to 4,096 colors and quality resolution equivalent to a fine color television.

The Amiga computer from Commodore-Amiga, Inc., a subsidiary of Commodore International, Ltd., is the first in a new line of personal/business computers, taking a giant leap forward in single-station multi-tasking, computer graphics and sound.

Based on the Motorola 68000 microprocessor, the Amiga is different from other computers using this processor because its intricate network of built-in hardware features lets the 68000 run at full speed most of the time. Three custom chips, one of which contains a co-processor, do much of the work, handling most of the burden of implementing the Amiga's graphics and sound features, as well as input/output operations. These custom chips allow the Amiga to outperform any other multi-tasking personal computer on the market today.

Another difference between the Amiga and other 68000 machines is that it can address eight megabytes of memory. Additionally, the Amiga is a completely open system. Its internal architecture is designed to accommodate upgrades and enhancements already being developed for powerful graphics-oriented machines of the future.

The custom graphics chip and the custom animation chip make possible the Amiga's superior graphics output, which you can fully utilize on a home television set as well as on an RGB monitor. Also available are multidimensional displays, selection of up to 4,096 colors and quality resolution equivalent to a fine color television. For business and educational applications, you can combine either 40- or 80-column text displays with the graphics modes to create extraordinary visual displays.

The Sound/Peripherals chip can duplicate complex sounds on each of four separate sound channels. By combining the power of this chip with the dual stereo sound-output ports, the Amiga can easily match the quality of commercial synthesizers. Furthermore, there are 11 ports to accommodate any peripherals you may want to connect to this computer.

Multi-Peripheral Machine

At release time, the Amiga will already have sophisticated peripherals with which to tap its extraordinary potential. One of the more elegant is a "frame grabber," which can take an image from videotape, digitize it and make it available for storage on the Amiga. A digitized picture can, for example, be embellished with Amiga graphics and sound, animated and stored for future use. A digitizer tablet will also be available.

A MIDI interface will be provided along with musical keyboards to take advantage of this supermicro's amazing sound capabilities. Other peripherals include a Gen-lock interface, a 1200-baud Hayes-compatible modem from Amiga and third-party sources, a hard disk with tape backup, a two-megabyte multifunction card and a 2400-baud modem. These are just a few already prepared. You will discover, however, that the Amiga warrants peripherals and applications that have yet to be developed.

The Amiga comes with an 89-key detached keyboard and a system box that houses the internal hardware and built-in disk drive. It has 256K of internal RAM and 192K of ROM. This is enough memory for many applications, but for those requiring more memory, it's easy to clip a 256K RAM pack to the front of the system unit, thus boosting the memory to a full 512K.

Compared to most personal computers on the market today, the Amiga's 256K of RAM is far more versatile because, thanks to the three custom chips, less of it is occupied with chores for system operation and language support.

As for data storage, the Amiga comes with a built-in 3½-inch disk drive that accommodates double-sided, double-density disks with a capacity of 880K. You're not limited to just 880K, however. The machine can accommodate three additional disk drives, either 3½- or 5¼- ►

Photography by Ed Judice

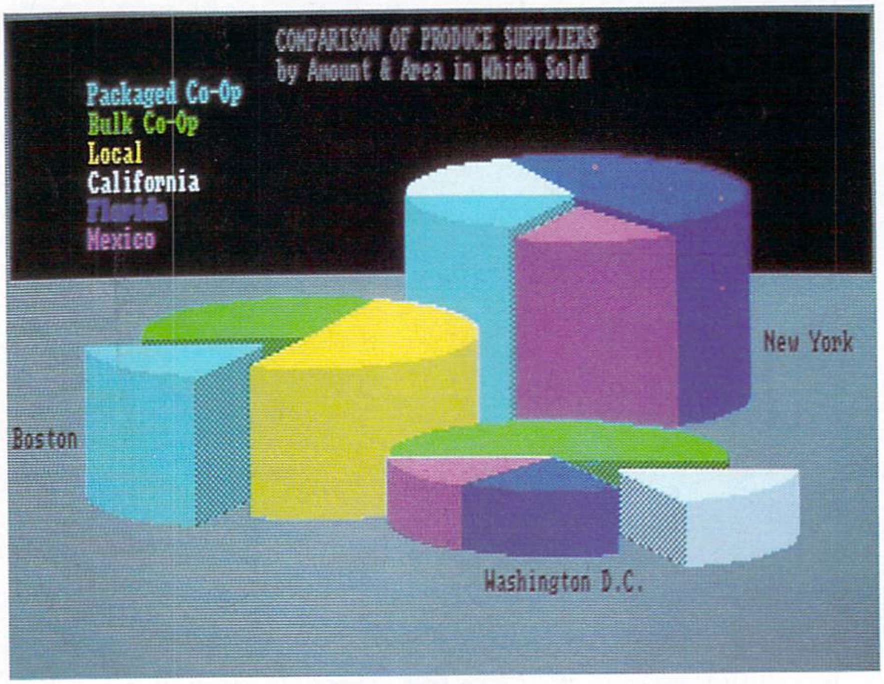

AMIGA HR
AMIGA

◀ inch. There will be a 20-megabyte hard disk drive available for it in the fall.

The Amiga incorporates truly superior graphics, which, however, will be used in applications far different from the typical entertainment field. They will provide a tool for serious graphics applications in both the business and consumer markets. The versatility of the graphics will also attract engineers, CAD/CAE users, architects, professional creative artists and anyone requiring fast and efficient graphic design capabilities.

Custom Graphics Chip

There are two basic kinds of screen displays on the Amiga: playfields and sprites. A playfield is the backdrop upon which sprites may be displayed, or with which they can interact. There are two playfield screens in the Amiga, each of which can contain its own set of user-defined graphics objects and its own coloring. The two playfields can appear together on one screen, one in front of the other, and you can also scroll them horizontally and vertically.



The graphics capabilities of the Amiga, compounded with its multitasking windowing environment and its ability to transform non-computerized photos and film clips into digitized color screens, make it a business machine like no other.

Sections of a playfield can be set aside and used as separate objects. These playfield objects can interact with sprites and you can manipulate them to create the effect of animation, all through the use of a hardware device called the "blitter." (Playfield animation will be discussed later in this article.)

The playfield display has two modes of operation: low and high resolution. The Low-resolution mode displays 320 dots (pixels) across the screen by 200 pixels vertically and provides a clear 40-column text display. This accommodates multicolored images.

An "Interlaced" mode provides twice the vertical display: 320 × 400 pixels. Interlacing is achieved by having the monitor's scanning mechanism perform two screen scans per cycle.

You can define a special "color palette," holding 32 different colors chosen from 4,096 colors available—the greatest variety of color selection offered as a standard feature in a personal computer. You can create highly detailed multicolored pictures using these two low-resolution modes, because you can tint each individual pixel with any one of your chosen 32 colors.

Then there is a special Hold and Modify mode, which lets you control the color even more intricately by using all 4,096 colors simultaneously on a television screen or an RGB monitor. This is all accomplished by barely utilizing the 68000 microprocessor.

High Resolution

The second mode of playfield operation, High Resolution, has two separate displays. It will give you 640 pixels across the screen, with each pixel being any one of 16 colors selected from your color palette. This display, however, can be achieved only on a high-resolution monochrome or RGB color monitor, not on a television set. There are 200 lines per screen in this mode, which is the one used within the Amiga user interface called Workbench. You can create graphs and charts with textual enhancements from this mode.

The second high-resolution display is an interlaced display that can handle 640 pixels horizontally and 400 vertically. Using this mode, up to 16 colors can be seen simultaneously.

Text can be intermixed on both low- or high-resolution displays. In low resolution, you can use 40 columns of text, with each character treated as a special graphics element and defined as a series of pixels in an 8 × 8 grid.

In High-resolution mode, you can use 80 columns of text characters per line. You can easily mix multicolored graphics with text on the same screen, since text is simply considered to be another set of special graphics. You can also create customized text fonts and have complete control over their coloring.

Amiga's "blitter" lets you place any kind of graphics element anywhere on the screen, making possible subscripts, superscripts, underlining, proportional spacing and other features.

Sprites

The second major display mode on the Amiga is Sprite mode. A sprite is a movable graphics object that is totally independent of the playfields and can be displayed anywhere on the screen, since it is not affected by other screen-display features. The Amiga offers eight programmable sprite processors, but you're not limited to eight sprites per screen, as you can reuse sprites on the same screen.

A sprite can be up to 16 pixels wide, with unlimited height, so a sprite the height of the screen would be 200 pixels tall. If you wanted to make one even taller than the screen, you could. The only limitation is the amount of memory available for sprite-data storage.

Each pixel of a sprite can have any of four colors, including transparency. There is also a special mode in which you can attach two sprites, thus increasing the number of possible colors to sixteen. You can display both sprites and playfield objects simultaneously on a playfield.

Custom Animation Chip

The Amiga has two animation systems. The first was already mentioned in relation to the blitter. The blitter is a hardware device that controls Playfield animation (or Frame Buffer animation), and it can animate low-resolution screen objects created in any of the two playfields.

Playfield animation is a technique through which you modify sections of a playfield by drawing an image, then erasing and redrawing it again onto the same background. The background displays are constantly being saved into a memory buffer and redrawn onto the background. This creates the effect of animation, as an image is very quickly replaced in a different location upon the same background. The blitter moves the screen-display data around so quickly that you don't notice all of the steps being executed.

In order to successfully perform this animation, the Amiga has a feature called "double buffering," which utilizes two separate memory spaces when performing background save-and-restore. While one section of memory is being displayed, the other is being modified in the second memory section. This totally assures that the viewer will never see a display being reconstructed on the screen.

The Playfield Animator allows you to create and move several dozen low-resolution screen objects. It also provides the hardware support for line-drawing and area-fill functions. Lines can be drawn at one million pixels per second—that's incredibly fast.

Sixteen colors per object are available. All objects in a playfield have user-specified priorities, which means that one playfield can be placed in front of or behind another. Both are independently scrollable, horizontally and vertically. Due to the custom graphics and animation chips, the Amiga accomplishes all of this without slowing down the 68000 microprocessor.

Playfield animation is a bit slower than sprite animation, but it is much more versatile in that the graphics objects are neither limited by size nor by the number of colors available per object.

The second animation system on the Amiga handles Sprite graphics. Sprites have several attributes, including that of priority overlay, like the playfields. You can make some sprites move in front of others, while still others move in the far background, with up to seven layers possible. With the transparency feature, you can also make sprites with see-through components.

Both animation systems have a hardware collision-detection feature. The screen can detect collisions between sprites, between sprites and playfield objects and between the two playfields themselves. What is this good for? These collision-detection features come in handy for use in games, for example, to determine whether a missile has struck its target. You can also use it to prevent a moving object from going beyond its prescribed on-screen boundaries.

Collision detection is also used in playfield animation. It is the process by which chunks of a playfield can be defined as individual objects and can be animated by the blitter.

Vivid Versatility

The graphics abilities of the Amiga will be appreciated by those of you who want to make video scenes or computerized images of real life. You can use the Amiga with VCRs and color digitizers. You could, for example, "take a picture" of any individual frame from a section of tape, digitize the image on the Amiga and store it for later use on disk. Or, you can take that same digitized image, color it with a paint program, overlay graphics and titles, use an animation program to animate the whole thing and then capture the final product on slides, hard copy or videotape. This is just the tip of the iceberg when it comes to the Amiga's business and educational applications.

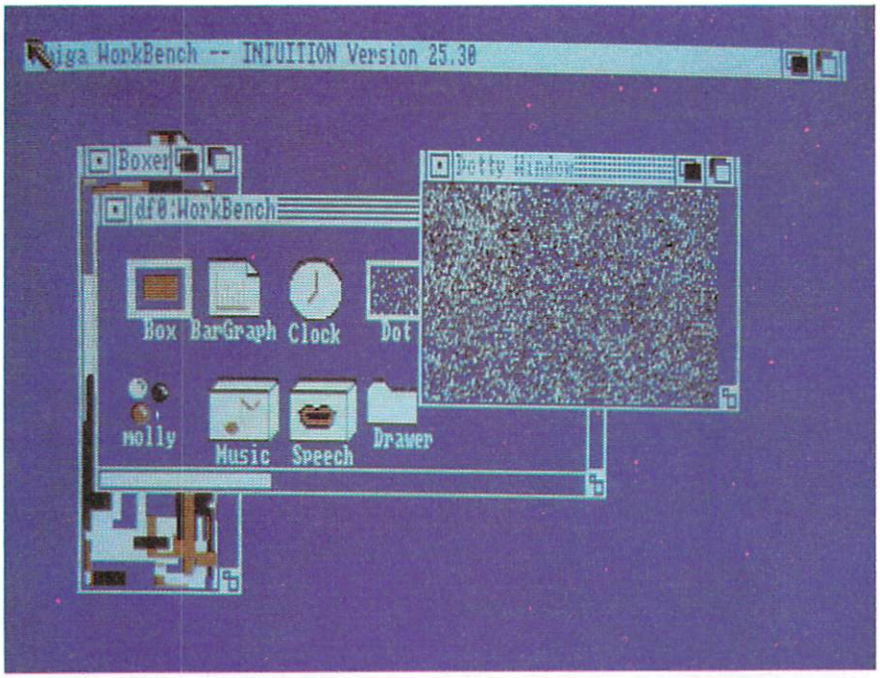
Words are really not adequate to convey an understanding of the graphics and animation features of the Amiga. It was only through seeing graphics demonstrations given on an Amiga that I could appreciate the unique animation available through hardware control.

The graphics-animation demo presented a cartoon-like portrayal of a street scene, with various figures and ►

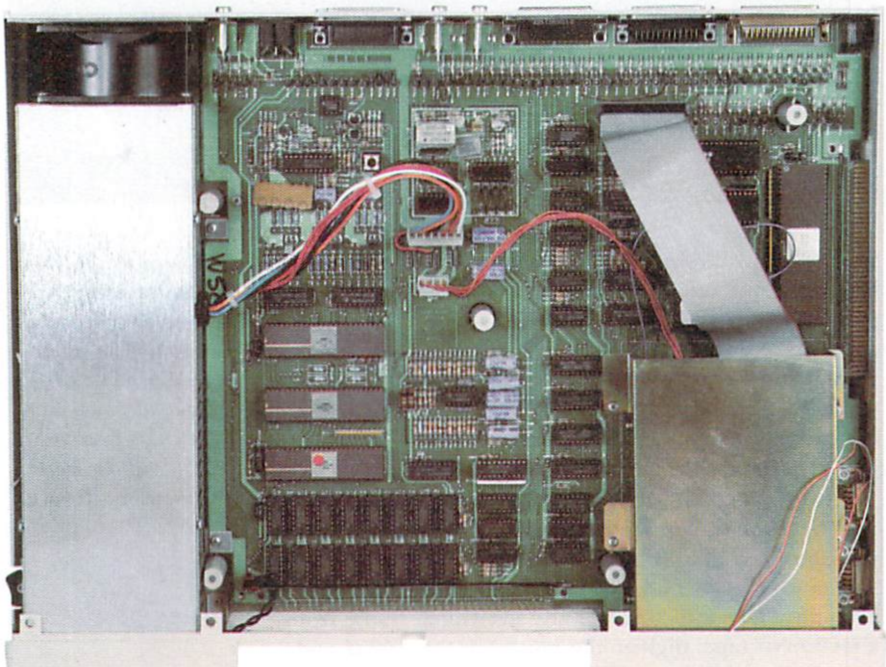


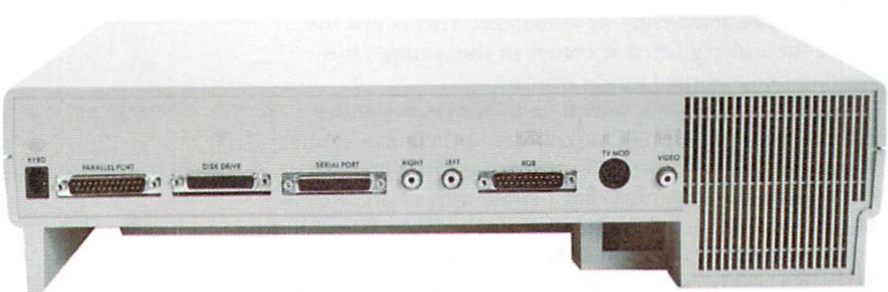
Illustration by Island Graphics

The third custom chip within the Amiga handles the sound capabilities, as well as the disk controller and other input/output functions. Again, this frees the 68000 chip for more important functions.



Multiple Windows illustrating icons. Taken from a preliminary version of the user interface, presented to show the capability of the system.





creatures strolling back and forth in front of and behind the landscape. One creature was a strolling robot, whose partially transparent head allowed the viewer to see the objects passing behind it.

Within the same scene, there was constant movement, with images moving alongside others, yet avoiding collision. Multi-tasking, often associated with business applications using text displays, was amply demonstrated in this lively graphics demo, for each image can be considered a separate task that performs its own functions.

The graphics systems on the Amiga are handled through the use of "pull-down" screens. A palette, containing the color choices available and the most recently used operations, can be pulled down onto the screen at any time. This allows you to select colors and features directly from the palette, rather than constantly having to go back to a main menu.

The two graphics chips handle all the color graphics and animation with an absolute minimum of power tapped from the 68000 processor. For more intricate program development, the 68000 is fully available to provide the power behind sophisticated software design.

Audio/Peripheral Chip

The third custom chip within the Amiga handles the sound capabilities, as well as the disk controller and other input/output functions.

There are four independently programmable hardware sound channels in the Amiga, as well as a digital-to-analog converter. You can control the volume and amplitude for each channel as well as create and modify the waveforms. Each sound channel can generate a three- or four-note musical chord, and you can easily select complete Attack, Decay, Sustain and Release features from a menu.

Speech synthesis with unlimited vocabulary and both male and female attributes is also possible through software that controls this feature.

All four sound channels can operate together, independent of the 68000 chip. Each voice has an 8 to 9 octave range, and Bass response exceeds that of most stereo systems. A MIDI interface, available for the Amiga soon after release, will allow you to attach highly sophisticated synthesizers. Sound can be output to stereo speakers, to a monitor, or to a television set.

Amiga's Friendly Ports

The Amiga boasts eleven ports that provide the options for virtually any peripheral you might want to add.

Among three video-display ports, there is first of all an NTSC (National Television Standard Convention) port for use with composite monitors. These monitors support color graphics quite well, but are not recommended for 80-column text displays.

Photography by Michael Brown

Second, there is a port for connecting the Amiga to a television set. Surprisingly, the Amiga provides an excellent 64-column text display on a color TV set. Most 80-column-output computers give an unreadable display on a home TV, but the Amiga actually lends itself to this type of display.

The third video port is the RGB (red-green-blue) analog/digital port, most recommended for use with the Amiga color monitor that will be available. This is a high-resolution RGB monitor, which will fully tap the best of the Amiga's graphics and text features.

For sound output, there are two separate stereo sound jacks, making it possible to achieve true high-fidelity stereo sound. The use of the Amiga for music and sound production is likely to flourish as more and more professionals discover its sound capabilities.

There are also three ports for adding peripherals: an expansion disk-drive port, a parallel port and a standard RS-232 port. The Amiga can support many different brands of printers. The difficulty will be in selecting the one that's most appropriate for your primary applications. As for color printers, the Okimate 10 and 20 thermal transfer printers from Okidata and the Diablo (series C) line of color ink jet printers are Amiga-compatible.

The disk-drive port can accommodate either 5¼- or 3½-inch disk drives. If you wanted to, you could daisy-chain up to three separate drives coming off this port. On the side of the Amiga, there is also an expansion-port bus, an important feature for third-party manufacturers. Because this port allows full access to the 68000 bus, most peripheral vendors will use it when designing hard-disk drives, tape backup, multifunction cards, etc.

Both the RS-232 and parallel ports can accommodate modems, and most off-the-shelf modems will work. However, three modems are especially recommended: a 1200-baud, Commodore-manufactured Hayes-compatible modem, the Hayes SmartModem and a 2400-baud modem from Tecmar.

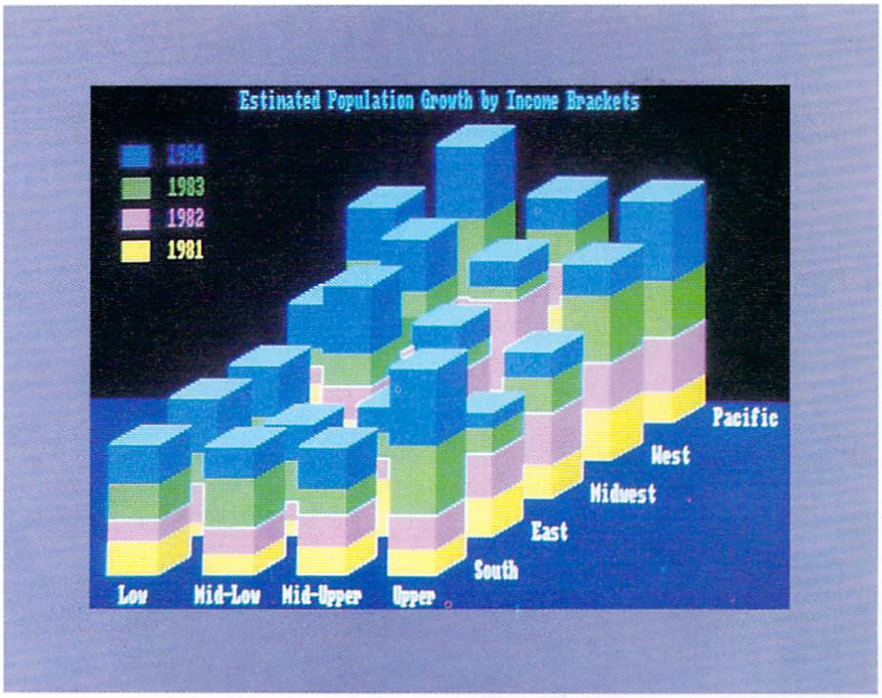
The two separate reconfigurable controller ports that are built into the Amiga can accommodate a mouse, game paddles, joysticks, graphics tablets, light pens and optical scanners. Lastly, there is a connector for the cable to the Amiga's detached keyboard.

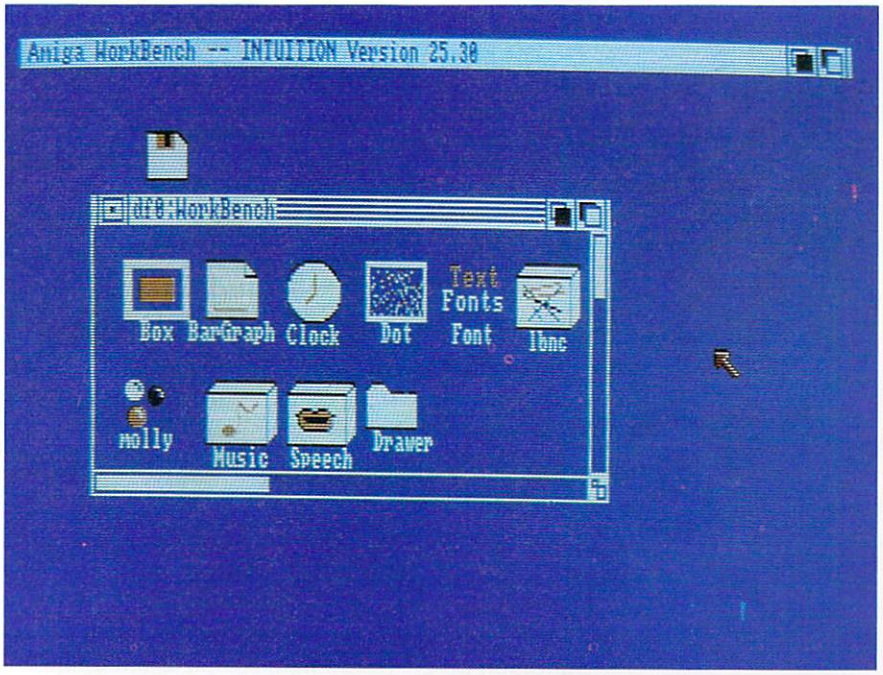
Now that you have an overview of the internal hardware, let's take a look at how you actually manipulate these powerful features.

User Interface

The Amiga User Interface is composed of system software that handles the multiple graphics-windowing systems of this computer. Controlled by a two-button mouse, this software allows total use of the powerful, multi-tasking capabilities of the Amiga—and this is true multi-tasking, not task sharing.

The Amiga's memory can hold many different software application programs, and they each can access all of the computer's hardware resources. The interface lets you display information from several applications without any conflicts and provides you with an orderly ►





Amiga Workbench. Taken from a preliminary version of the user interface, presented to show the capability of the system.

	Amiga	*Mac*	*IBM PC*	*PC AT*
Microprocessor	68000 Motorola 16/32 bit	68000 Motorola 16/32 bit	8088 Intel 8/16 bit	80286 Intel 16/24 bit
Speed	7.8 MHz	7.8 MHz	4.77 MHz	6 MHz
Memory	256K RAM 192K ROM	128K RAM 64K ROM	64K RAM 40K ROM	256K RAM 64K ROM
Expansion (useable RAM)	Up to 512K (external—up to 8 MB)	Up to 512K	Up to 640K	Up to 3 MB
Disk Capacity	880K 3½"	400K 3½"	360K 5¼"	1.2 MB 5¼"
Video Display	RGB Composite Color TV	Monochrome	Monochrome	Monochrome
Color	Yes 4,096 colors	No (black & white only)	Separate color card[1] 16 colors on one screen	
Highest Color Resolution	640 × 400	512 × 342	640 × 350[1]	640 × 350[1]
Keyboard	89 Keys Numeric Pad	58 Keys	82 Keys Numeric Pad	84 Keys Numeric Pad
Speech Synthesis (built-in)	Yes (unlimited text to voice)	No	No	No
Music	4 channels[2] (stereo)	1 channel[3] (monaural)	1 voice	1 voice
I/O Ports (built-in)	RS 232 Parallel Serial	Serial	No	No

Table 1. *A comparative look at the features of the Amiga from Commodore, Apple Macintosh, IBM PC and PC AT.*

[1]Not included in IBM PC and PC AT basic units.

[2]The Amiga has four hardware audio DMA channels, which feed two stereo output ports. The processor is not accessed for sound generation.

[3]The Macintosh has four software-driven voices, which use over 50% of the processor's time.

◄ method of controlling several activities at once. This full-performance system is the epitome of single-station multi-tasking.

What is amazing about the Amiga is that each of its application programs can have complete and unhindered access to all the features of the computer. Each application "thinks" that it is running on its own distinct terminal, referred to as a "virtual terminal." There can be as many such terminals as application programs, all coexisting in the computer.

Once a program has activated its own virtual terminal, it can access the full range of the Amiga's hardware features. It has an entire screen display for itself, and it can print text and tap all of the graphics and sound modes. One program can actually open up several virtual terminals, each one functioning as a totally distinct computer system.

Windows and Screens

The virtual terminal is presented to you through a "window" that you can modify, shape and move anywhere on the screen. Each window is capable of handling its own software application. The number of windows appearing on a screen at one time is only limited by the amount of memory required to perform the applications residing in those windows. You can overlap windows, change text fonts within them, change their size and, through the use of "gadgets," completely control the activities going on within them. By moving these gadgets with the mouse, you gain control over each window within each screen.

Screens were developed in the Amiga for handling multiple windows that share the same graphics attributes. However, using multiple screens, you can have windows with different levels of resolution and color simultaneously displayed on the monitor. For example, you could divide the display into two horizontal screens. In the upper screen, you could have a spreadsheet in one window and a word processor in another, each running four-color, 640 × 200 resolution. In the lower screen you could have a business graphing program running in a window using 16-color, 320 × 200 resolution. All three programs will be running simultaneously, in different windows, using different colors and resolutions. This kind of multi-screen, multi-window, multi-resolution multi-tasking is completely beyond the capability of other graphics/windowing environments, such as Digital Research's GEM or Microsoft's Windows.

Screens are controlled just like windows, and any given screen can be one of four colors. They are dragged around, overlapped and uncovered by means of the two-button mouse. The only difference between a screen and a window is that screens can't be horizontally scaled. The Amiga's screens are actually of secondary importance to you; the multiple graphics windows are your main concern.

The Amiga User Interface usually defaults to Workbench, which is both an application program and a screen. Workbench has a high resolution of 640 × 200 pixels, with a four-color display. Most people will use this feature as a predefined screen, on which disks are opened and application programs are run.

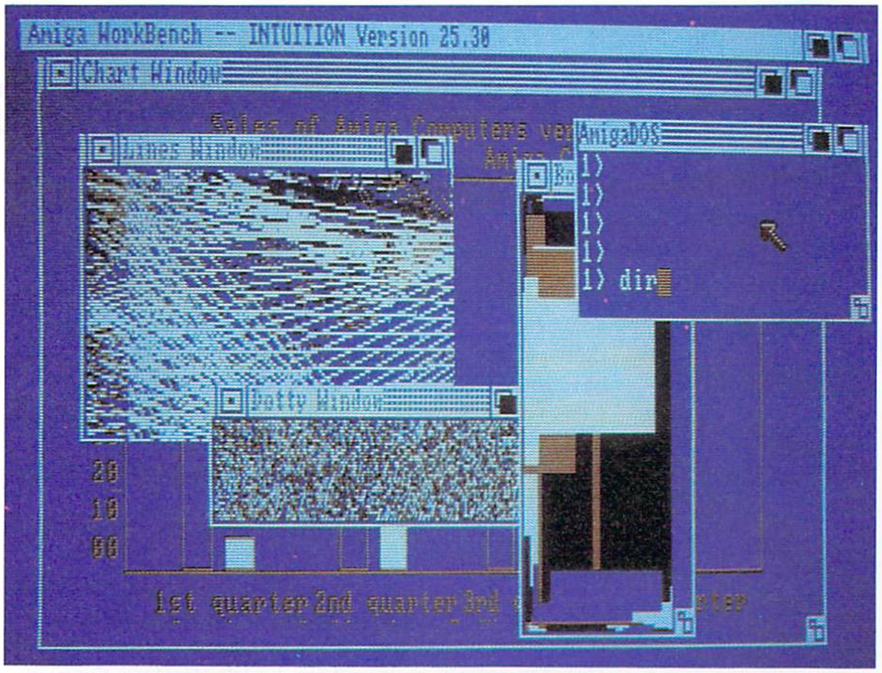
Iconics and Command Line Interpreter

Icons are pictures representing activities that the computer performs. These are good for introducing you to a new system and for running turnkey operations. You simply move a mouse around, which in turn controls a screen cursor. When the screen cursor is positioned on top of the appropriate icon, you press the button on the mouse and the desired action takes place. This obviates the need for typing in direct commands—and having to learn the specific syntax rules for each command.

However, what about the proficient user who may want to gain more direct control over the computer? For him or her, Workbench offers a full command line interpreter within each screen beneath the windowing system. With access to the command line, you can directly load and run a program from disk. You can control the entire operating system via direct commands issued at this command line, and it is available at any time within all screens.

Menu System

Each window is assigned its own menu containing its own particular text and graphics items. You can control



Multiple Windowing. Taken from a preliminary version of the user interface, presented to show the capability of the system.



Photography by Michael Brown

Interacting with Amiga

By Jim Heid

Imagine a world where televisions have typewriter keyboards instead of the familiar tuner, volume control and brightness knobs, and instead of turning the dials—a task we learn at a frightfully young age—you have to type awkward, hard-to-learn commands, like CHG CHNL(5) to change the channel and VOL UP(.56) to turn up the volume. To make things worse, every manufacturer uses different commands for the same tasks, meaning that buying a new TV or just trying to work the one in the hotel room involves learning a whole new set of commands.

You might chuckle at this imaginary, keyboard-driven world, but it's exactly where most personal computers come from. Instead of letting you perform tasks you're already used to, such as opening file drawers, throwing things in trash cans and pushing buttons, most computers force you to learn cryptic commands, then simply sit there with a blank screen and a blinking cursor, waiting for you to type something. It's no wonder that people are often intimidated by computers, and it's not surprising that the majority of the workforce doesn't use them. How can a computer increase your productivity when you have to spend hours—or months—just learning how to use it?

Enter Amiga

Fortunately, the engineers at Commodore-Amiga realize that you shouldn't have to learn how a computer operates to be able to use one. The result is the Amiga, one of a new breed of personal computers that lets you work the way you're used to working instead of forcing you to learn awkward commands. The Amiga separates you from the technicalities of the computer, letting you concentrate on your work. It simplifies complex concepts by using a fast and easy-to-use two-button mouse in conjunction with some things that have always been worth quite a few words—pictures.

You've seen road signs that get their messages across using pictures, such as squiggly lines beneath a car to indicate slippery conditions, or a truck angled downhill to indicate a steep grade. The Amiga uses pictures, or *icons,* to represent disks, documents and applications programs. To begin using a word processing program, for example, you don't have to type WP or some other strange command. Instead, you point to the word processor's icon with the mouse, then click the left button twice. To throw away an old memo, you don't type Del Memo, as you would with an old-fashioned computer. Instead, you point to the memo, and, while holding down the left mouse button, you "drag" the memo over to the trashcan icon.

Menus and More

Icons are only part of the Amiga's approach to simplifying computer use. Another equally important aspect is the *pull-down menu.* Pull-down menus are lists of available commands that appear instantly when you click the mouse button on menu titles that appear along the top of the screen. For example, a typical Amiga application program might offer a menu titled Style. When you click on the word Style, a list of type style options appears—Bold, Underline, Italic and so on. To choose the style you want, you simply hold down the right mouse button and move the pointer down until the desired style is highlighted, then release the button. By contrast, most other computers offer menus, but instead of letting you point and click to make your choice, they force you to type awkward commands, such as Control-PS.

Worse yet, other computers' menus are often completely different from one program to another. One program might make you type E to edit a document, while another asks for the number 3. One program's menus might appear at the bottom of the screen, while another's might not appear at all until you type a command. The software that creates menus was built into the machine by the Amiga's engineers. This means every company developing software for the Amiga can create menus that look the same and operate in the same way—using the mouse. The advantage? Once you've learned one program, you're well on your way to learning others.

This consistency between programs is just one of the things that makes the Amiga so easy to use. In the future, we'll examine these features in more detail. We'll also take a look back in time at some of the innovators who inspired the Amiga, like the people at Metacomco, creators of AmigaDOS. (It's interesting to note, for example, that many of the Amiga's personality traits aren't new, but were developed in research labs over twenty years ago.) So, stay with us—the journey promises to be an exciting one. ■

Jim Heid is a freelance writer who has been covering microcomputers since 1978.

the menus within Workbench. Text and graphics are accommodated within each menu. You can select whatever items you want within a particular menu without having to return to a main menu. This is an advantage of the Amiga User Interface over others on the market.

There is only one active window that receives input from you. This window, highlighted on screen, determines which menu will appear when you press the mouse's "Menu Button." Another feature of the Amiga User Interface is the use of submenus that appear if a selected menu item has further options available. A word processor window may have an option for font selection on its menu; when selected, a submenu will appear, with options for italics, underlining, boldface, etc.

Programming Languages

The Amiga doesn't have a built-in programming language; instead, it comes with a disk-based version of Basic. There are several additional languages already available that the Amiga supports. These include Pascal, Logo, C and Assembler. Much of the preliminary software development for the Amiga was done in C on other computer systems. This computer is an open system, allowing for easy transportability of languages and programs.

The Amiga Keyboard

The Amiga has a detachable keyboard with 89 keys and a numeric keypad for easy large-scale data entry. It also has ten function keys across the top, which are available for all kinds of software control. There are also two special Amiga keys to the left and right of the space bar (for resetting the system).

Also included on the keyboard are TAB, CTRL, two SHFT keys, two ALT keys, CAPS LOCK, four cursor-direction keys, a large return key, a help key, back space, DEL, ESC and a ∿ key.

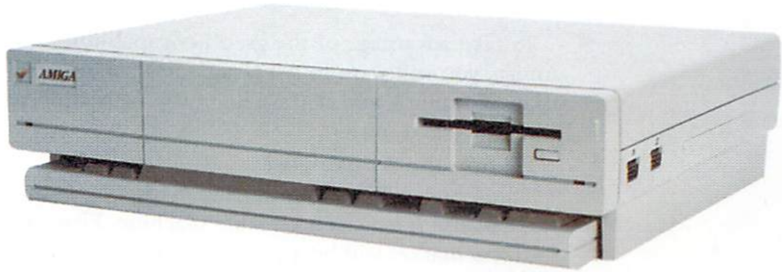
Software

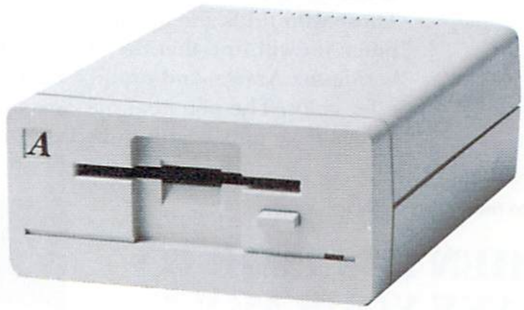
When you buy the Amiga, you'll get the keyboard and system unit, which houses the hardware and disk drive. To get you going, you'll also receive several disks holding various applications software programs.

On disk, you will get AmigaDOS, which contains the Amiga's operating system and user interface. A tutorial program on how to use the machine is included, created under contract by Mindscape Software. You'll also get the disk-based version of Amiga's Basic (called ABasiC), a speech synthesis program that features male and female voices and an unlimited vocabulary, and finally, Amigascope, a rolling graphics demo from Electronic Arts.

You will have a choice of word processors when you buy the Amiga. If you're a newcomer to computers, you'll probably want to purchase Textcraft, an entry-level word processor put out by Commodore-Amiga. For more sophisticated word processing needs, The Software Group's Enable/Write word processor is available. This is one of the well-known applications programs in the integrated commercial business package called Enable, which contains a word processor, a database, a spreadsheet, a telecommunications package and a graph program.

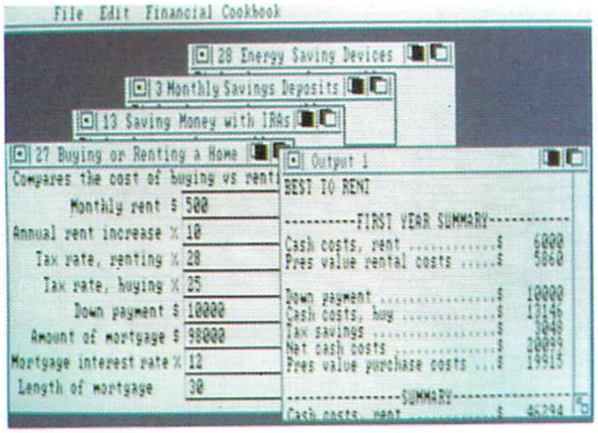








Photography by Michael Brown



◄ To take advantage of the graphics capabilities of the Amiga, you will want to get Graphicraft, created by Island Graphics, and if you like music, Musicraft, from Everyware, is a must.

Who Is the Amiga For?

The Amiga will overlap distinct marketing boundaries because it is such a versatile machine. First, the business market will be a primary target. Most people will find that the Amiga costs much less and offers much more than other currently available computers. Those who think the Macintosh is the greatest computer yet will find that the Mac significantly pales beside the Amiga, and not just because the Mac doesn't offer color. The potential business applications of the Amiga have only begun to be imagined. The graphics capabilities, compounded with the multi-tasking windowing environment and the ability to transform non-computerized photos and film clips into digitized color screens, make the Amiga a business machine like no other.

Not only will the business person benefit from the unique features of the Amiga, but, more importantly, the low cost of this powerhouse will place the small business on a competitive level with larger, wealthier firms.

The Amiga will eventually move into the educational market for the same reasons that it is bound to penetrate the business scene. School systems are like small businesses and often can't afford high-priced, high-performance teaching aids. The Amiga, in the hands of a good teacher, will totally redefine the term computer-assisted instruction.

Another market the Amiga will enter is that of professional artists and musicians. This computer is the first to go beyond the clunky graphics and animation heretofore seen on personal computers, and in so doing, merits the admiration of the refined eye and ear.

When you take a step back and look at all the features of the Amiga, it is evident that this computer is much more than just another advance in computer technology. The Amiga is a new kind of machine that will encourage developers and users to step beyond traditional ideas and redefine the world of microcomputing. ■

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ANNOUNCEMENT

How Borland's Turbo Pascal™ Found A Partner That Matches Its Amazing Speed.

Turbo Pascal meets the Amiga™.

Turbo Pascal™ hates to wait. With Turbo, it's 'go fast' or 'go away'. So before we committed to becoming the exclusive Pascal programming language for Commodore's new Amiga, we had to be sure that it was up to speed. It had to be fast—and it is. 68000-based, with custom chips and graphics, Amiga doesn't dawdle. (In fact, Amiga's speed is going to be a headache, a heartache and a headwind to the Competition.)

We think Amiga will take off—just like Turbo Pascal did. With more than 400,000 users world-wide, Turbo Pascal has become a de facto standard—and grown into a complete Turbo 'family'. A family that now includes Turbo Database Toolbox™—a Turbo Pascal enhancement with fast data access and sorting talents; Turbo Graphix Toolbox™—a set of graphics procedures keyed to business, scientific and engineering applications; and Turbo Tutor™—the one tutorial that will take beginners and make them experts, AND will even teach a few things to the experts!

Turbo Pascal and all its associated tools, will be available for the Amiga in the first quarter, 1986. It's already implemented for the IBM PC family and IBM-compatibles, and other microcomputers from Texas Instruments™, Hewlett Packard™, DEC™, Wang™, Apple® and NCR™.

When you're faster than anyone else, you look for someone who can keep up with you. Turbo Pascal found Amiga.



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Cynicism and Seduction, Speed and Software

By John Pandaris

I stood up straighter, lost my cynical sneer, gaped rather stupidly and elbowed my neighbors in the ribs. The Amiga had cracked my armor—with sheer, naked power.

The Amiga is going to change the way American offices do business, but no one yet knows just how. I'm *AmigaWorld*'s business applications columnist, and I don't know, either. In this column, we'll follow the computer, its users and software companies—with luck, we'll stay half a step ahead of them—and find out.

Amiga Solutions won't be strictly a business column in the sense of Honeywell mainframes and Fortune 500 accounting. I sold it to the editors as a "business/personal productivity column," to explore how people work with the Amiga, in settings ranging from corporate offices to homes, and the tools available for that work. I'll try to land somewhere between "Amigas on Wall Street" and a random software roundup, but productivity will be a general topic.

That suits me because I'm a generalist, interested in how people use computers rather than in comparing the arctangent functions of WhizzoCalc Release 3 and AmeriCalc 2.10. Amiga Solutions will try to spot some trends or general directions in the Amiga support and software industry. I've evaluated products and pontificated on trends for half a dozen magazines, and I couldn't resist getting in on the ground floor with *AmigaWorld*.

Snubbing the Mac

I was also hired, I suspect, as the magazine's resident conservative, or cynic, with no connections to Commodore or *AmigaWorld*'s parent company, CWC/P—someone who's formed a healthy respect for the IBM PC and its MS-DOS imitators, 1981-vintage technology though they are, and was impressed but not ga ga over the advent of Apple's Macintosh.

The current phrase "power user" will fade as did the odious "user-friendly," but its meaning makes sense in the MS-DOS world. Once you learn eight or nine cryptic commands and dive into a huge pool of rarely simple software, you can do quite well with an antique PC. I'll be the first to admit that MS-DOS' user interface (computerese for how you work it) takes some learning, but I never tire of challenging Mac users to drag race: While Mac-Mouseketeers delete disk backup files, clicking and dragging them one by one to a cute picture of a trash can, I can type del *.bak ten times.

The comparison is particularly unfair to the original (January 1984) Macintosh, which challenged computing's de facto standard with barely a handful of available programs and a bunch of hardware handicaps. Today's 512K Mac, with outside companies' hard disks (and PC vendors' prompt mouse-and-window additions to MS-DOS), have shown the value of easy instructions for powerful software. But the first Mac was best appreciated as a preview, a demo, a scratch-and-sniff ad instead of a bottle of perfume.

The 1984 Mac, to put it plainly, promised terrific software, but it simply lacked the hardware to rival the mighty IBM. Apple's ads, billing themselves as the inventors of the personal computer, are shameful lies, but the Mac team's battle cry of an "in-



Photography by Michael Brown

The central concept of the Amiga's architecture is to preserve the 68000 for the data-crunching it does best. Other support chips handle mundane chores, such as reading keyboard input and stepping the disk motor, leaving the 68000 free for better things.

sanely great" computer is merely silly. Computers are simply tools, and no computer is insanely great. Bach, Hawthorne and filet mignon may be insanely great, but no computer deserves this accolade, especially not one with only 128K, no industry-standard parallel printer port and a single disk drive, the latter only slightly quicker than the Commodore 64's infamous 1541, which "loads data faster than you can type it!"

First Impressions

My cynicism was tested on April 10, when *AmigaWorld* editors and I attended a sneak preview of the Amiga at Commodore's Pennsylvania headquarters. Except for having only one built-in disk drive (880K on a microfloppy is fabulous, but single drives make vital file and disk backups a tiresome process), the Amiga looked impressive—a nice keyboard, lots of interfaces and expansion ports, a sharp display. To be exact, it looked like a PC and worked like a color Macintosh.

In order to keep the entry price low, Commodore has configured the basic Amiga as a 256K machine. It has also priced the expansion up to 512K at only $200. So that, for any serious user, the machine will be typically configured as a 512K machine.

An Amiga engineer showed off the ultracolorful graphics, the smooth movement and animation and the magnificent sound and music with a program that turned the Amiga into a banjo, a snare drum and a ballpark organ. Dealers and writers oohed and aahed: The Amiga was clearly a performance-caliber musical instrument, a CAD (computer-aided design) drafting system and the best arcade-game computer ever designed.

Having awakened at 3:45 AM to catch the plane, I was cranky and cynical: The microfloppy drive wasn't as fast as an IBM hard disk, and we couldn't tell how the Amiga would sound by itself, without big stereo speakers under the table (where, if it were my desk, they'd be kicked to death in a week). More important, what about everyday applications? "What's the point?" I muttered to the writer beside me. "People don't use symphonic sound and animation. They use spreadsheets."

Then, blessedly silencing a booming, animated bouncing ball, a second engineer said, "Now let's turn to the operating system and put some windows on the screen," and flicked two windows to and from the display as quickly as he could tap the mouse button. I stood up straighter, lost my cynical sneer, gaped rather stupidly and elbowed my neighbors in the ribs. The Amiga had cracked my armor—with sheer, naked power.

All computers are fast; along with detailed accuracy, speed has been the machines' raison d'etre since the barn-size ballistics plotters of World War II. Even primitive computers can perform calculations, format text and so on faster than any human or team of humans working by hand.

But the Amiga is *blazing* fast, eerily fast, preternaturally fast. The Apple II beats an abacus and the IBM PC beats the Apple, but, watching the Amiga demonstration, all I could think of was something I once saw during a sports car race at Connecticut's Lime Rock Park: A race-prepared, street-illegal, 500-horsepower Corvette thundering down the main straightaway, slowing for the turn, and then being passed from out of nowhere—from the beginning of the straight, a quarter-mile behind—by a knee-high, white, whirring Porsche 935 Turbo. Other micros simply aren't in the Amiga's class.

Let's Get Technical

There are two reasons for the Amiga's superior speed. The first is its Motorola 68000 CPU (central processing unit), the same chip found in the Macintosh and scores of multi-user office systems. The 68000 handles 32 bits of data at a time, though it funnels input and output at only 16 bits at a time. The IBM PC's Intel 8088, by contrast, has half the capacity—16-bit data, 8-bit address—and its definition of "at a time," the ticking clock rate that governs computing in tiny, discrete steps, is one-third slower.

But, powerful as it is, the 68000 isn't the ultimate processor; Intel and Motorola have made advances, apparent in IBM's ferocious PC AT and Apple's rumored "Turbo Mac." And no chip is quick enough to satisfy software designers, who cry "Faster! Faster!" with even more zeal than users like me. Such programmers have pioneered something that has become standard practice in the PC world, and it's the second secret of Amiga's success: cheating.

Part of it isn't cheating so much as sensibly allocating resources; the racer who owned that Porsche Turbo didn't use it for trips to the drugstore. The central concept of Amiga's architecture is to preserve the 68000 for the data-crunching it does best. Other support chips handle mundane chores such as reading keyboard input and stepping the disk motor, leaving the 68000 free for better things (like a master chef who needn't worry about arranging napkins and silverware).

The cheating part involves DMA (direct memory access), the trick of moving data

through RAM while bypassing the normal CPU and input/output channels. For putting information on the screen ("Go Directly To Video Port; Do Not Pass CPU"), it gives a speed bonus analogous to using a telephone hot line rather than going through a switchboard.

It complicates matters if you're trying to make hardware PC-compatible—you must map obscure byways as well as main roads—but DMA has been a staple of IBM software since programmers found the limits of the 8088 chip (it's fast, but not fast enough for the likes of Lotus 1-2-3). And the Amiga combines the speed of the 68000 with massive amounts of direct memory access.

The 68000 is aboveboard, but the Amiga's top secrets are three custom chips code-named Agnes (animation), Daphne (graphics) and Portia (ports, sound and peripheral control). Besides things like Portia's four-voice sound hardware and mouse/joystick interface, they contain 26 DMA channels plus an additional microprocessor, called the "copper" (part of Agnes, it's the main mechanism for controlling the other two chips, freeing the 68000 from nearly all the work of redrawing the display and updating audio channels).

The most important DMA channel, also part of Agnes, is called the "blitter"—a circuit designed to draw lines and copy screen display data, moving or animating images faster than the general-purpose 68000 could. Never mind that it makes gee-whiz arcade games; the important thing about the blitter is that it runs windows, desktop or workbench environments, through hardware instead of sluggish software. If the rules for shuffling windows and menus are like frequently used phone numbers, Amiga has them memorized. Slower systems, like a PC running Digital Research's GEM, have to look them up.

It's this hot-rod hardware that makes the Amiga quicker than the Macintosh and even the PC AT, both of which must process graphics, sound and windows through their CPUs. Combine the Amiga's dedicated design with the fact that computers are swift anyway (they yawn and idle between fast typists' keystrokes), and you can see why I elbowed my neighbors at the demonstration.

Do you think I'm exaggerating about yawning during pauses? This 68000 chip spends half its time doing internal operations instead of addressing memory, so it works at full speed, although Amiga engineers only allocated it every other clock cycle (the discrete steps I mentioned) during the constant, TV-style process of redrawing the display screen. The odd cycles go to disk and audio and display DMA, and the 68000 must share the even cycles with the copper and blitter, which can hog cycles during especially complex or colorful animation, the one time it appreciably slows or handicaps the CPU.

Even under these circumstances (what the developers' tech manual cheerfully calls "nasty mode"), the Amiga should manage to add your spreadsheet before you lose patience. A clock cycle takes 280 billionths of a second, and there are 226 of them during each horizontal scan of a line of screen dots.

Yours for the Tasking

By now, you must realize that the Amiga chips delegate so much responsibility that the CPU is left with only part-time work. Most of the time, in most applications, the 68000 will be as underworked as a circus strongman tearing a Kleenex.

To remedy this waste of power, here's the second thing that impressed me in Pennsylvania: You can assign the Amiga multiple jobs, running more than one program at once. To use jargon, the Amiga is a multi-tasking computer (not to be confused with multi-user systems, which let people at different terminals share a CPU). In fact, it's more multi-tasking than you are, or than you'll need it to be.

This reflects a concept that, until Amiga, has been more common than true multi-tasking among personal computers: foreground and background tasks. Printing a long document, for instance, is often turned into a background task by a spooler (an acronym for simultaneous peripheral operations on line), an area of memory or a separate box that takes the document in one gulp so the computer is free for other work. "Desk accessories," made popular by the Macintosh and followed by PC products like Borland International's SideKick, let you call up notepads or calculators while using a program. The next release of AmigaDOS will incorporate more of these desk accessory functions to exploit the multi-tasking capabilities of the Amiga, thereby enhancing personal productivity.

No doubt many Amiga owners will use multi-tasking in this simple way; I'll probably play Pole Position while printing future columns. But multiple Amiga programs, even those in windows overlapped or completely hidden by the one you're using, ►

Because of the Amiga's speed, multi-tasking operating system, its ability to address 12 times the memory of the PC and 2.5 times that of the AT, and its hardware and software support for hard disk and tape back-up units, the Amiga is uniquely positioned to fulfill the needs of the business world—at a price that has the competition trembling.

don't wait in the background like calculators. They're fully operational, all functions active, as if running by themselves.

As far as they're concerned, they are. To quote the tech manual, each multi-tasked program has a "virtual terminal," meaning that the software thinks it has a keyboard, monitor and CPU of its own. If I call you on the phone while you're editing a report, you can switch your attention to me often enough, say "Mm hmm" at the ends of my sentences, to make me think I have your undivided attention. To fool computer programs, you have to switch very fast, indeed.

The End of Integration?

The business environment is a hungry environment. The original IBM PC was introduced in the fall of '81 in a 16K version with a cassette port; it was the needs of power users that eventually drove IBM to introduce the XT and AT. A comparison of the Amiga with the PC AT is useful. The AT can address 3 megabytes (mb) of memory; the Amiga can address 8 mb. The AT is the only micro in the IBM line that supports multi-tasking under MS-DOS 3.0. The Amiga also supports multi-tasking. The AT has hardware and software support (e.g., support hierarchical file directory) for a hard disk. So does the Amiga.

The AT, however, obviously cannot provide any of the advanced graphics, animation or sound capabilities that make the Amiga so exciting for vertical markets, especially design environments and the creative arts.

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Commodore has said that the Amiga is the first in a family of products based upon the same technology—given the enormous capabilities of the Amiga's architecture, it is easy to imagine how subsequent versions of the Amiga could be configured to meet the special needs of the business community even more directly. The only missing piece in the Amiga's hardware strategy for business is networking and telecommunications, which Commodore has said it will address in the first half of 1986.

How we use multi-tasking, what difference it will make from day to day, will be one topic I'll follow in this column. We've found the obvious uses already—to sort a lengthy list or receive telecommunications information while working on something else—but it'll be fun to look for more, to relate the Amiga's potential to what is humanly possible.

The Amiga can, but I can't, use a spreadsheet and write a letter at the same moment. But I'd like to have both available and flip between them (though not as often as every 280 nanoseconds), and I'd like to refer to spreadsheet data in my letter. This, though it may be cut-and-paste instead of true multi-tasking, is where I suspect the Amiga will shine, and where it may make its most significant impact aside from graphics and sound. It represents the triumph of dedicated applications and the demise of integrated software.

Integrated software is a crusade, in which the Holy Grail is a blank sheet of paper: a screen on which computer users can do anything, in any combination, they might do with a pad and pencil. Scribble some words near the top, put a graph in the middle, tally a table at the bottom, print it out just so. . . it's a gloriously simple idea, but it's hard enough to break a programmer's heart.

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Ovation, an MS-DOS package that genuinely seemed to grasp the "blank page" concept, sent critics into ecstasy in late 1983 previews—and dragged its vendor into oblivion a year later, having never quite beaten its bugs or made it to the market. Titans clashed last summer: Lotus's Symphony versus Ashton-Tate's Framework. The latter won all around, while the former took the spreadsheet event, but neither one has set the world on fire.

What's good about integrated software is its versatility, such as the freedom to splice spreadsheet rows into text files. What's bad is that there has never been an integrated package whose functions are as good as single-purpose programs. The "one big program" that Ovation promised to be is as distant as Einstein's unified field theory; integrated packages are still mainly separate programs tacked together. And, as long as they're buying separate programs, people want the best ones.

Nobody buys Lotus 1-2-3 for its database function, an awkward imposition of filing on a spreadsheet format. Some buy it for its graphics, a spreadsheet adjunct valuable enough to tolerate a separate program and disk-swapping for printing. But most buy it because it's a big, fast, excellent spread-

sheet. Given the power to have several programs instantly available without starting and stopping, I'll wager Amiga owners will choose individual excellence over integrated compromise. In effect, Amiga owners, using the machine's multi-tasking capabilities, will be able to create their own integrated packages using whatever combinations of individual programs they choose.

Some things will have to be worked out, of course. AmigaDOS has a cut-and-paste clipboard like the Mac's; software companies must support it, with a common format for swapping material between applications. Separate programs probably won't let you play "what-if" games right up till printing time, though it would be ideal if changing the spreadsheet on page 2 automatically redrew the graph on page 5. Integrated software fans complain that learning different programs is a chore; presumably, Amiga commands will be at least similar, with the mouse and menus. Besides, thousands of folks use 1-2-3 and WordStar, which haven't a command in common.

The early deadline has made this an atypical column; I've indulged my love of technical explanations and sweeping generalities, but I haven't had the chance to test any Amiga software. I'll have more to say about software in the future, though, preferably in conjunction with an exciting new product that *AmigaWorld* has promised me first crack at. If it's available, it'll be the star of next issue's column; if not, I should at least have gained more hands-on experience to back my windy generalizations.

Once we learn about its site and strategy in a Big Blue world, we can turn to the Amiga as a star in its own right: a machine that can not only do brand-new things (e.g., using voice synthesis as part of a super telecommunications system or presenting boardroom demonstrations with animated graphics, music and narration), but that will also let us do traditional things in brand-new ways. It's not insanely great, but it's the most impressive microcomputer hardware I've seen. I'm looking forward to writing about it.

Writing, that is, with a word processing program, working on one document in one window. I'm a conservative about some things. ■

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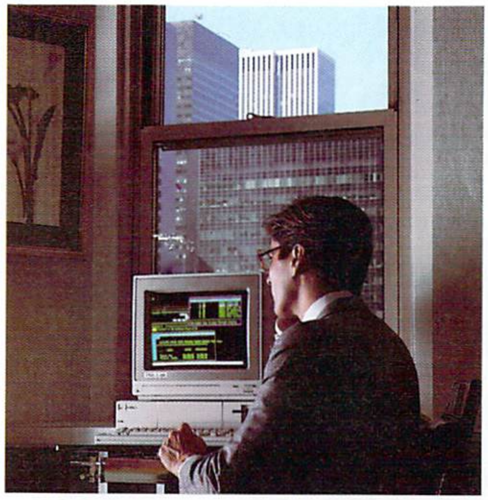
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Creativity



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What If. . .

Either you already own an Amiga personal computer, or you are thinking about buying one. Why? Probably for a number of reasons. Computers of any sort can be valuable tools for writing, storing information, telecommunications, games and hundreds of other things. But why an Amiga? The price is a definite plus. Not many other computers can offer even a quarter of the Amiga's features at twice the price.

The Amiga can do all the things that other personal computers can do, only faster, better and cheaper. The Amiga can address more memory (and can therefore run larger spreadsheets) than the IBM PC. It's easier to use and offers far more features than the Macintosh. And, the traditional database management, word processing, accounting, inventory controlling, mailing lists, telecommunications, forecasting, modeling, simulations and number crunching can all be handled with the Amiga. And you never have to take it for walks.

The graphics capabilities of the Amiga are far beyond any other computer costing under $20,000, and the sound and musical qualities are also remarkable. The 68000 chip is a powerful processor, able to leap tall calculations in a single keystroke, but there are other capabilities of this machine that are not quite so easy to see.

With the MIDI interface scheduled to be out sometime in 1985, the Amiga will be able to interface with the most advanced electronic musical instruments. Combine this with the already impressive array of musical instruments and sounds built into the Amiga, and you have the ability to orchestrate a musician's dream of synthesized, professional quality music. All for well below sound studio prices.

With that kind of sound editing and generating equipment available at a reasonable cost, the Amiga should spark renewed interest in music from a classical standpoint. People will be more inclined to buy themselves and their children electronic keyboards, drums and synthesizers, with software to help them learn, at a price less than a second-hand piano. The Amiga could also influence the music of the future. Given the ability to generate custom sounds and even custom "instruments," the Amiga looks like a strong candidate as the new musician's tool of choice, expanding the "one-man-band" concept far beyond what anyone thought was possible.

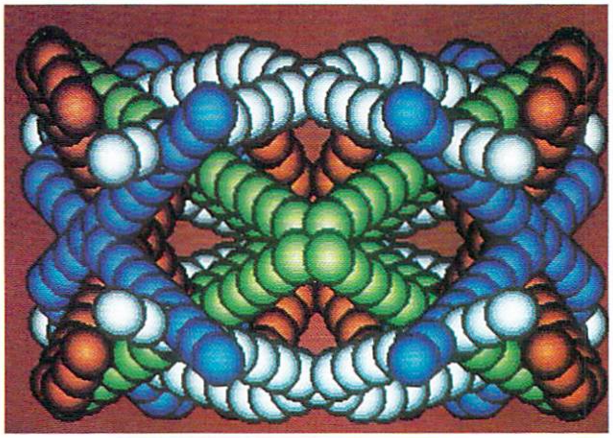
Companies working on music software are also going to bring new turns to the world of sound and music. People will be able to create pieces that cannot be played with anything other than a computer. We'll hear melodies so complex that no human fingers could work fast enough, on strings or keys, to play them. But the Amiga will play them perfectly every time.

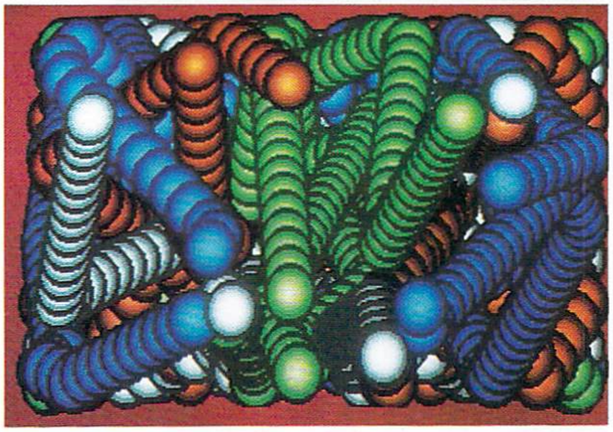
The Amiga's built-in voice synthesis will change the way we use computers. There have already been a few pioneering software and hardware manufacturers who have worked on the integration of voice and software, but now that it is within easy reach of anyone with an Amiga, I think that there will be some remarkable things done in many areas. The educational aspects of a talking computer, combined with some innovative teaching programs (not just drill-and-practice exercises), means that students will be able to learn new languages at their own rate, learn how to read and write, have the computer teach them about computers or any of a thousand other things. It's not hard to foresee a time in the near future (one or two years at most) when the Amiga as a tutor will supplement public school teachers in many areas where personalized instruction is preferable to a classroom environment.

But the graphics. Ah. . .the graphics! The Amiga is going to out-shine any and all in this area, and Amiga owners are about to take the rides of their lives—into a new world of interactive animation, sounds and colors, streaming by in an arcade-like blast or drifting leisurely in detailed splendor, matched only by Disney and his artists. The Amiga can do all this and more, if asked,



Illustration by Matthew Foster





Ah . . . the graphics! Amiga owners are about to take the rides of their lives—into a new world of interactive animation and color.

and people *will* ask. There is finally an aforable computer than can do the kinds of things that software designers have concocted in their imaginations, but haven't been able to execute with existing hardware. Games conceived and written long ago, which were left on the drawing board, will finally see the light of a color monitor thanks to the Amiga.

Digging a bit deeper into the Amiga is like owning an expensive car for the first time. There are plenty of hidden features and little things, which show that someone has taken his time in designing this machine. All of this adds up to more than anything else on the market.

The people who buy Amigas for office or home use will probably not encounter things built into the Amiga to provide software and hardware manufacturers with open architecture and an easy programming environment. For a developer, having full access to the 68000 bus through the expansion port and direct memory access of up to eight megabytes are just two elements of Amiga design that make the machine special. Other outstanding features include the custom VLSI chips, which handle such things as graphics, color, animation, music and speech synthesis.

Programmers have the option to develop on host machines, like the IBM PC, Sun Systems or on the Amiga as a host computer, and easily convert Apple Macintosh software to run on the Amiga, by making use of hardware drivers for the screen, input/output functions, etc., and a large library of ROM routines. The ROM library is also a clever way to ensure compatibility with future versions of the Amiga. They may add new chips and features to the next generation of Amigas, but they plan to keep the same ROM calls, entry points and results. Current software will run on a next-generation Amiga, even if the software doesn't make use of all the new features that Commodore might cook up.

A multi-tasking operating system, windows, variable color and screen resolutions, icons, pop-down menus, a two-button mouse and other standard features of the Amiga add to the developer's list of reasons for wanting to work on the Amiga. The fact that the Amiga is the first fully developed multi-tasking personal computer below the Unix environment is enough incentive for many developers. But apart from the built-in hardware bonuses, there is another non-hardware plus in working with the Amiga—the company itself. Many developers have said that they are getting a great deal of support and expert advice in almost every field from the people at Commodore-Amiga. This is going to make quite a difference to everyone working on new products.

Indirectly, these factors will have an impact on the rest of us mortals who will be using the machine. Since the Amiga is such an attractive computer for developers of software and hardware, many new products will appear on retailers' shelves. Since the Amiga has features that no other computer can offer, developers will be exploring the boundaries of the machine. Like the software writers who have been kicking ideas around for a long time but couldn't implement them

Productivity



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because of hardware limitations, there are also hardware manufacturers who have had ideas for peripherals that only now can be put into action.

The Amiga is a challenge for them in many ways. Since the machine will be priced lower than any other machine with similar features, hardware and software manufacturers will have to try to keep prices down. As a result, this should bring a number of products into a broader market. Products that were previously sold exclusively to small numbers of people using expensive computers can now be sold to a wider range of users.



Not only will this spur the development of new kinds of software and hardware, but it will also mean that more people will see some of the work that has already been done on much more expensive machines. Computer-Aided Design and Computer-Aided Engineering software has been around for a few years, but most of the really remarkable things that have been done in these areas haven't been seen by the majority of personal computer owners.

Electronic music has exploded with new, sophisticated breakthroughs, and now the Amiga will bring some of these phenomena out of the multi-million dollar sound studios and into homes. Video animation and special effects will not be restricted to Hollywood productions, such as Star Wars and TRON. Before long, it won't cost a fortune to create your own "high-tech" special effects or make your own MTV videos. Digitized images printed on T-shirts won't be a shopping mall novelty for long.

Of course, there won't be many people who will want to do *all* of these things with their Amigas, but there will be thousands of people who will buy the computer for one or two of these reasons. The vertical markets are where the Amiga will shine.

Any business will find that an Amiga is a worthwhile investment. If nothing more, the Amiga, with a business graphics package, will produce professional quality charts and graphs in minutes. Enter the values and click a button, and you have a bar chart all filled in and ready to print. Not quite what you had in mind? Click the button a few more times, and you have a pie chart, an exploded pie chart and an exploded three-dimensional pie chart. All within a few moments of sitting down at the machine. The Amiga produces clean, sharp, professional-quality reports, papers and proposals. And if the boss doesn't like it, a few minutes on the Amiga is all it takes to change the report. Anything that

Illustration by Jack Haeger

Enable — coming soon for the *AMIGA!*

"Enable is everything Symphony hoped to be."

PC Magazine *February 19, 1985*

"Quite simply, this package has so many outstanding attributes that even the worst skeptics of integrated software have to be impressed. The spreadsheet is very close to 1-2-3; the word processor combines the best thinking of WordStar, MultiMate, Volkswriter, and EasyWriter; the data base offers the functionality of dBASE II, but with many of the ease-of-use features of PowerBase; and the program offers business graphics and telecommunication. Taken as a whole, Enable surpasses the functionality of Symphony, Framework, Aura and Open Access."

IBM PC Update
December, 1984

". . . as powerful as a collection of stand-alone programs, and it offers the benefits of integration to boot. What's more, it runs in only 192K bytes of memory."

ComputerWorld
March 20, 1985

"Offering true integration among all of its applications modules . . . [Enable is] a powerful production tool that can serve everyone in the office, from data entry personnel to the vice-president of marketing. Each module could stand as a full-powered application in its own right."

PC Magazine
February 19, 1985

"Enable is one of those programs that can be up and running with most of the features you need in a few hours. As you need more, you can get deeper into the program and learn at your own pace."

InfoWorld
January 21, 1985

Enable first in "Performance" rating—including speed and capacity of all modules tested. Enable first in "Versatility" rating—including power and functionality of all modules tested. Enable rated first in overall evaluation of the word processor module.

Software Digest Ratings Newsletter
Rating of 15 Integrated Products
December, 1984

"Enable, a five-function integrated system from The Software Group, merits a close look by any individual or organization interested in a solid package that is well balanced in all of its applications."

Popular Computing
March, 1985, Paul Goldner, Raymond Hood, Yoram Lirtzman, Michael Wilding

". . . if an office is looking to step up to across-the-board integration with a multitude of functions . . . this is the one program to seriously consider."

Personal Computing
March, 1985

"Enable welds its five applications together with outstanding integrity—yet each is exceptionally full-functioned in its own right."

Business Computer Systems
January, 1985

"Enable . . . may be the first program to make you give up your dog-eared WordStar, dBASE II, Smartcom and Lotus 1-2-3 disks."

Business Software
April, 1985

"Enable may legitimately claim to be the only package you'll ever need."

Computer Buyer's Guide and Handbook
November, 1984

Integrated software is no longer a matter of choosing which compromises to live with.

enable™
integration without compromise

Circle 15 on Reader Service card.



The Amiga can do all the things that other personal computers can do—only faster, better and cheaper.

◄ requires charts, graphs, diagrams, illustrations and even pictures, can be done on the Amiga. With a video camera and a frame grabber, complete repair manuals could be composed in-house, complete with labels, arrows, footnotes, etc. The Amiga can go all the way from eye-grabbing bulletin board messages to multi-volume publications.

But you're not limited to the printed page, either. Imagine a presentation where graphs change over time, where you can show the "what ifs" of a changing market or product, a new idea, an improvement, an alteration, an add-on to existing machinery or changes in personnel or office space. All of this can be done in color and data can be changed in minutes.

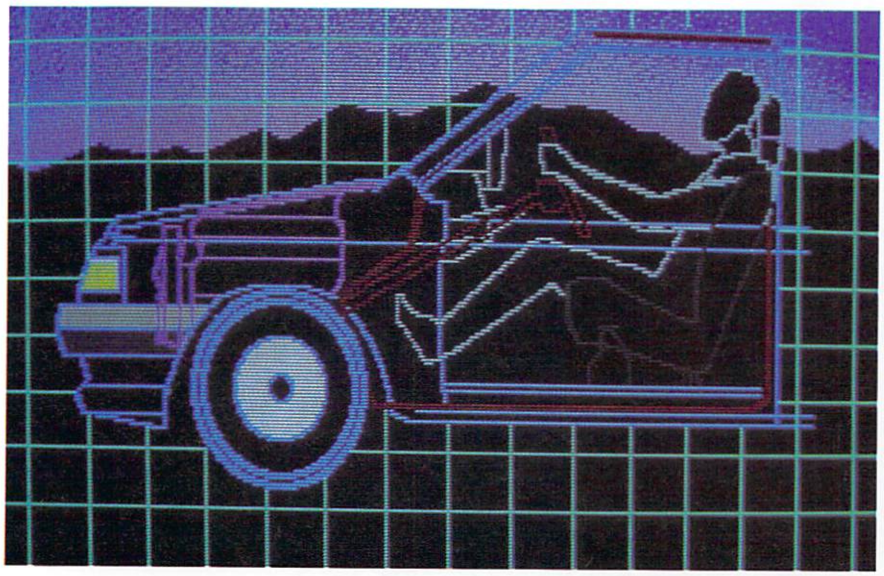
The Amiga will be an incredible "what if" machine in planning. The machinery in a manufacturing plant or living room furniture can be arranged on-screen first. You can arrange the pieces of a puzzle, any size puzzle, from scrambled words to arrangements of charmed quarks. Designing can be a certain, carefully calculated, one-engineer affair or the collaborative brain-storming of a committee, all done with a mouse, digitizing tablet or light pen—quickly, cleanly and with the option of starting over or printing out the results on hard copy, color hard copy, slides or videotape.

Designers of anything will find that the Amiga, with the right software, is the ultimate design processor from the initial inspiration to the finished product. Virtually anything can be designed with the Amiga—machinery, clothing, electronic circuits, parts for anything, doilies, cabinets, toys, weapons, cars, vacations, bicycles, tarrot cards, greeting cards, business cards, story boards, game boards, diving boards, emery boards, board rooms, flow charts, ocean charts, three-dimensional charts and maps, wall charts, etc.

With the Amiga's easily accessible, built-in speech synthesis, self-documenting software will become self-explaining software. The music and sound features will be a boon for performers, composers, audio-philes, audio engineers, jingle writers, symphony writers, radio stations, television stations, recording studios, record companies, language labs in schools, musical instrument manufacturers, music video producers and movie producers. We'll all rise for our national anthem played on an Amiga, send singing Amigagrams (electronically), make sound tracks for home video, record telephone messages, use talking alarms and security systems that can call the police or fire department, and so on and on. . . .



With the Amiga, Computer-Aided Design software will reach a broader market.



I'm just having a little bit of fun here, but everything mentioned is not only possible, but probable. Look around you. Just about everything you see could have been designed using an Amiga. Just about anything on paper could have been produced with an Amiga. Just about everything you see on TV could be enhanced using an Amiga. There are other computers that can do these things, and there are some computers that can outperform the Amiga in certain areas, but there isn't a computer anywhere that can match the Amiga feature for feature, at any price (let alone the Amiga's price). The Amiga is a launching pad for hardware, software and a score of things that haven't been invented yet.

Some people may never do more than write memos with the Amiga, while many more will see the possibilities and begin explorations. If this is all a bit too much to swallow then take half a step backward. At the very minimum, the Amiga is state of the art. A very good computer at a very good price. It's easy to use, there's a solid company behind it and enough software to put the machine through its paces in half a dozen application areas. It's upgradable, expandable and not bad looking. Have I forgotten anything? ■

GSW

Address all author correspondence to Guy Wright, c/o AmigaWorld *editorial, 80 Pine St., Peterborough, NH 03458.*

Illustration by Island Graphics

Amazing Graphics

We had the Amiga set a table filled with graphics appetizers and visual delicacies to give you a taste of form, shape and color. Bon appétit!

Somehow, "amazing graphics" doesn't say enough about the Amiga's visual capabilities. It's like saying Bach was an audio engineer or Shakespeare was just a manipulator of text. But the Amiga *does* have amazing graphics and when reading about it, you'll encounter that phrase a number of times.

Since the Amiga's graphics are such a predominant feature, there will be numerous references to the 4,096 different colors available; the 640 × 400, 640 × 200 (with 16 colors) and the 320 × 200 (with 32 colors) resolution modes; the seven layers of sprites; and the dedicated graphics chips that make high-speed animation possible (without using any of the 68000's impressive speed). And there'll be talk of bit blitters, NTSC video output, frame grabbers and gen lock add-ons (planned for the future).

But what does all this mean to the user in the home or office? (How many colors do you need for a database or spreadsheet, and just what is a frame grabber anyway?) It all boils down to—you guessed it—amazing graphics. Take the pieces a few at a time.

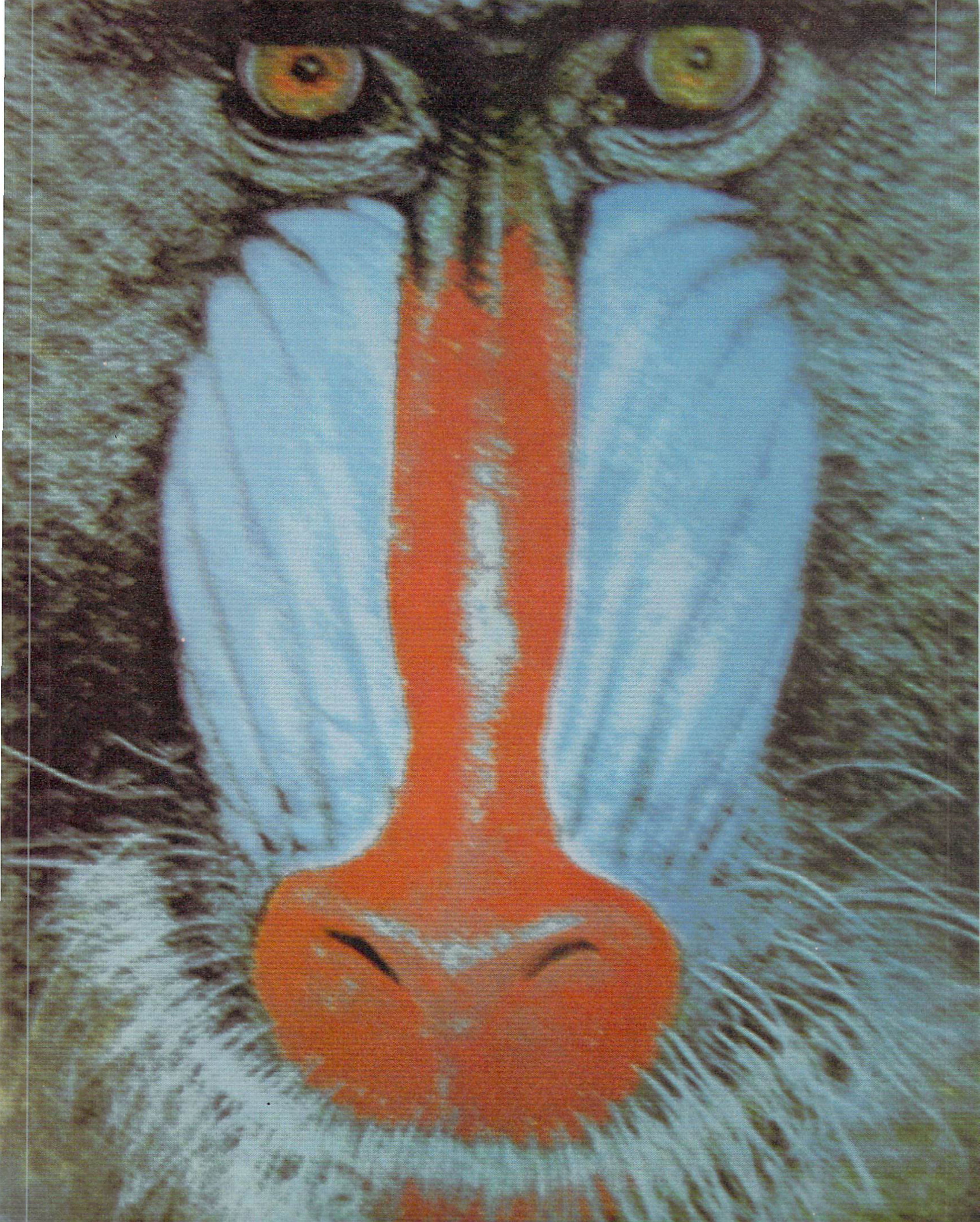
First, 4,096 colors. That doesn't take much explaining. There are only a few personal computers anywhere that can match that number. You won't be able to put all 4,096 colors on the screen at one time with the basic Graphicraft package, but you'll be able to put any 32 of those colors on the screen at once. And with a small amount of programming wizardry, you can expect to see commercial programs using hundreds (maybe thousands) of colors at one time. (A quick note: Island Graphics, the company that developed Graphicraft, is working on some advanced graphics programs that will make *all* other graphics programs look like paint-by-numbers.)

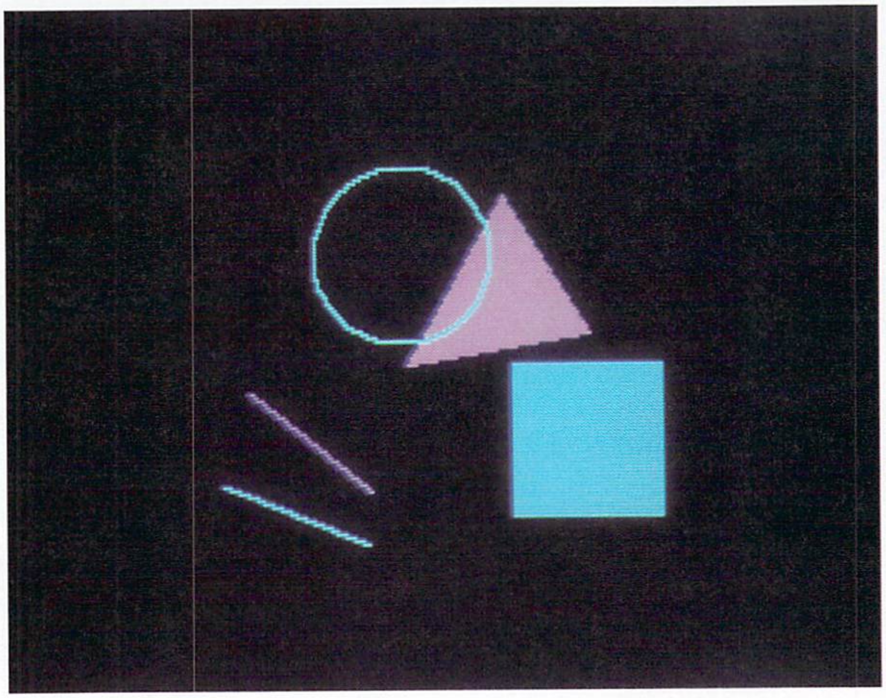
What about the resolution modes? In the case of graphics, the higher the resolution—the more pixels in a matrix—the better. A pixel is a dot on the screen; it can be the size of a period or larger. It's the difference between drawing with a fine-point pen or drawing with a magic marker. And, by the way, low resolution on the Amiga (320 × 200) is the highest resolution achievable on most other home computers.

What about sprites? A sprite is a block of graphics information that the computer treats as a single unit. For instance, if you want the letter A printed on the screen, the computer goes to a *master list* of characters, pulls out the pattern of dots necessary to form the letter and puts the whole block pattern on the screen. A sprite is just a larger version of a character-block pattern. The advantage is that you don't have to keep drawing the same object over and over each time you want to move it around the screen. You just instruct the computer to draw it in a particular place, then issue movement commands to place it wherever you want. The result is faster and smoother animation.

But that isn't where the idea stops. Sprites are usually one size when defined (or added to the master list) and even though the computer can expand the size of a sprite vertically or horizontally, what happens when you want something larger and more detailed? You could combine sprites to form larger images, but the Amiga is more versatile, letting you define any size area as a block, which the computer treats as a sprite, so you can move it around on the screen as you like. To accomplish this feat, the Amiga uses something called a blitter. To put it simply, the blitter moves blocks of information around in the computer very quickly and bit by bit, if you wish.

On top of these sprites and blocks and bit blitters, there are priority levels (where sprites can pass in front of or behind other sprites) and even transparencies (where you can see through sections of sprites and view objects that pass behind them). All of these special effects are done without bothering the 68000 chip, so the 68000 can worry about other tasks, such as calculating the angles of refraction in an optical modeling simulation; the graphics chip will handle the actual display of a lens being rotated through intersecting, multicolored laser beams. ►





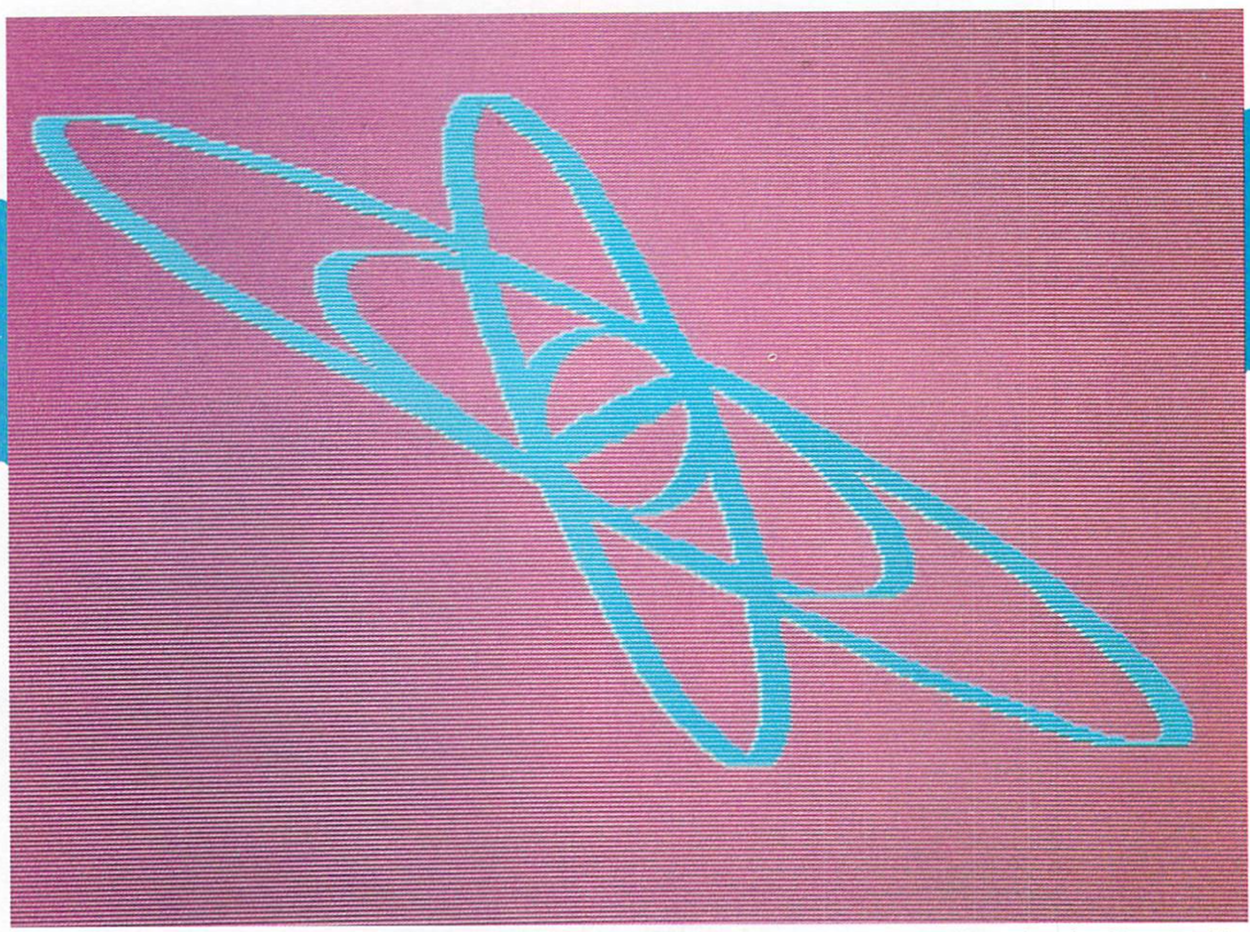
◄

The last few add-ons mentioned above, the gen lock and frame grabber, wouldn't be possible if the Amiga weren't up to NTSC standards (NTSC is a television standard in this country). A gen-locking device lets you mix video signals (don't ask me how), and a frame grabber can take a single video frame, digitize it and feed it into the computer. So what? So take your home video tape recorder and superimpose graphics and titles over your newest product as it rolls off the assembly line, or take a single frame of your Aunt Maude, draw a mustache on her (or airbrush it out if she already has one) and print the results on your printer.

Much Ado About. . .Much

All these fancy features mean that, graphically, the Amiga can do it—sharper, faster, easier, in more detail, with more colors and in more ways than any other single computer ever made. If you just want to draw pictures, the Amiga gives you more options than any other personal computer. If you want to see outstanding animation, the Amiga, right out of the box, will out-perform anything in its class.

Airsickness bags included with flight simulator software? Exploded, 3-D, color pie charts? No problem.



Previous page: The Mandrill. A digitized photograph showing the range of colors and detail possible on the Amiga. Above: Basic circle, triangle, square and lines. Right: Any thickness of line, brush stroke or pattern can be combined with various graphic tools such as ellipses, curves, circles, etc.

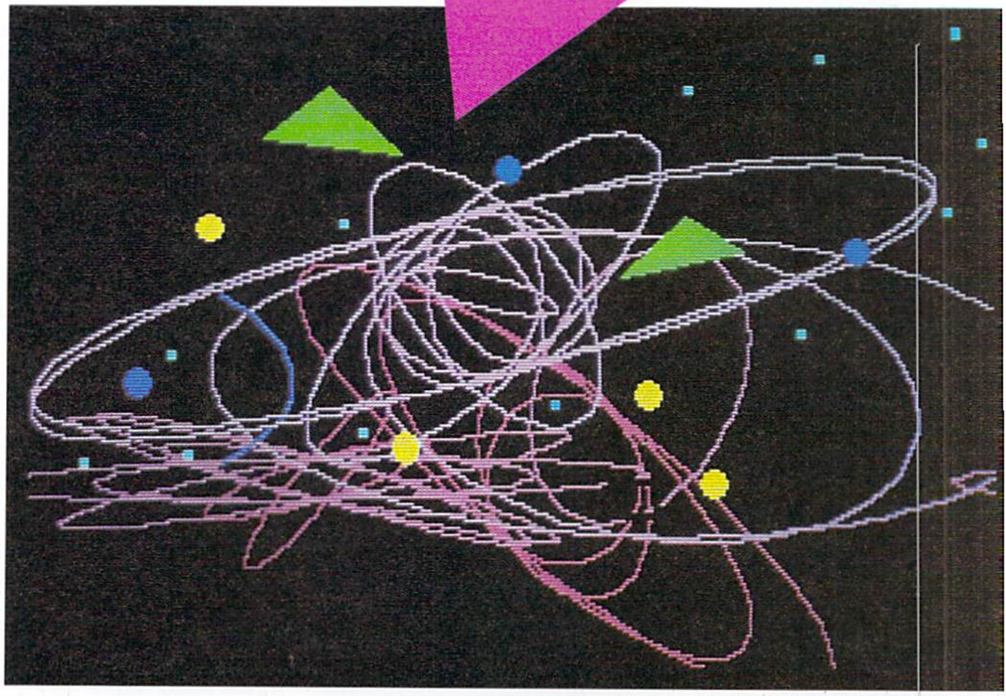
Illustrations by Glenn Suokko

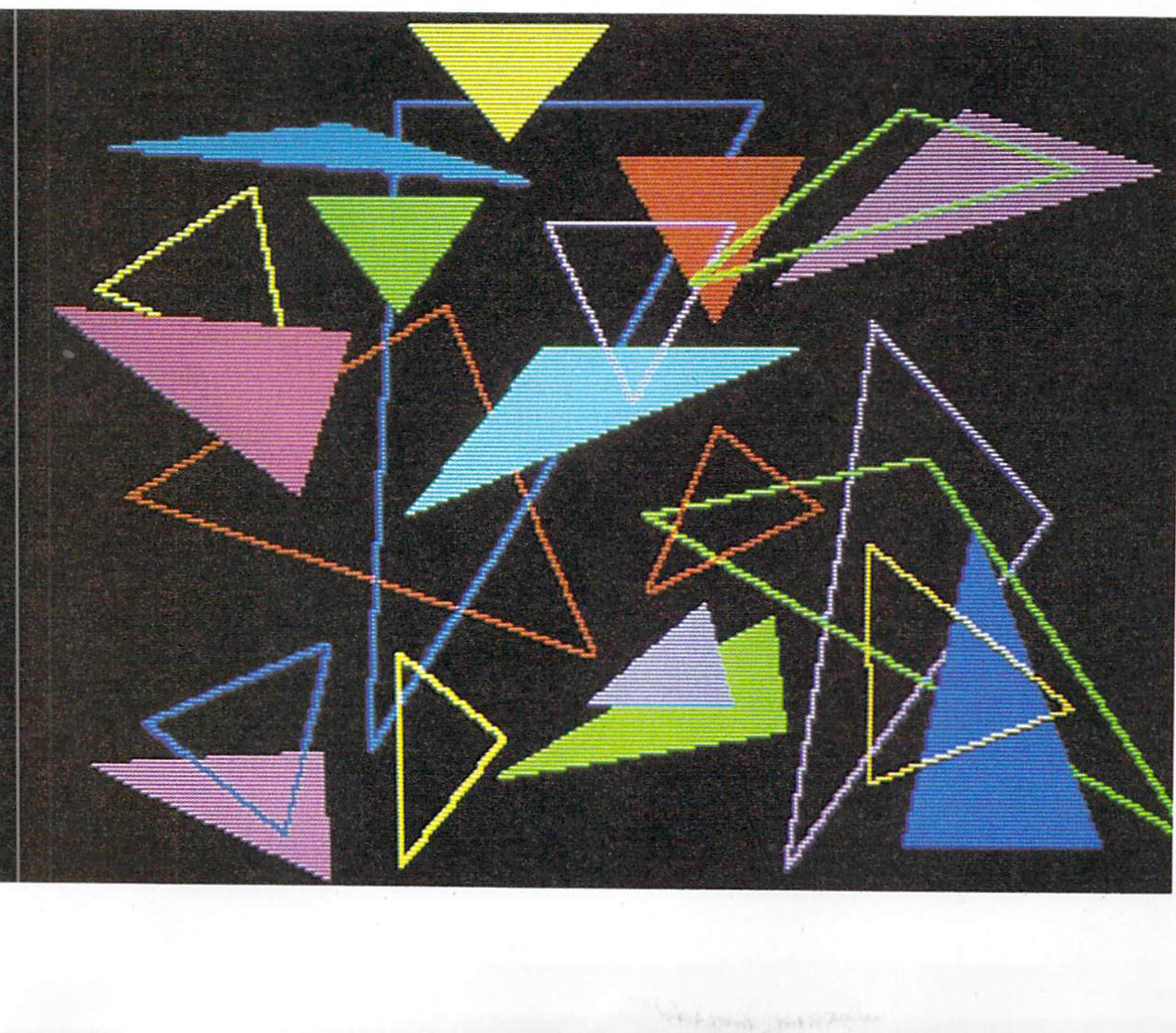
How about a videotaped walking tour of an assembly line? You can freeze the frames, label items with clean arrows and descriptions and even add graphics. Print out these frames and include them in a report or training manual. Why do you need graphics capabilities in a business? Well, how much do you want to show that can't be done on a normal typewriter? How much time or money have you spent on training, charts, graphs, presentations, logos and designing?

Create your own ads, logos, charts, graphs, illustrated reports, music videos and store displays. The Amiga is a design processor for visual images when words aren't enough.

These pages are just the tip of a very large, very colorful iceberg. All done on an Amiga. All designed to show you a sampling of the graphics possible on this machine. In later issues, we'll continue to look at and explore the Amiga's graphics in more detail, but to start, we thought we'd just touch on some of the features. Let the Amiga do a little showing off for the cameras. Flip a page or two and see what we mean.

We don't really need to say it again, but what the heck. The Amiga has amazing graphics! ■

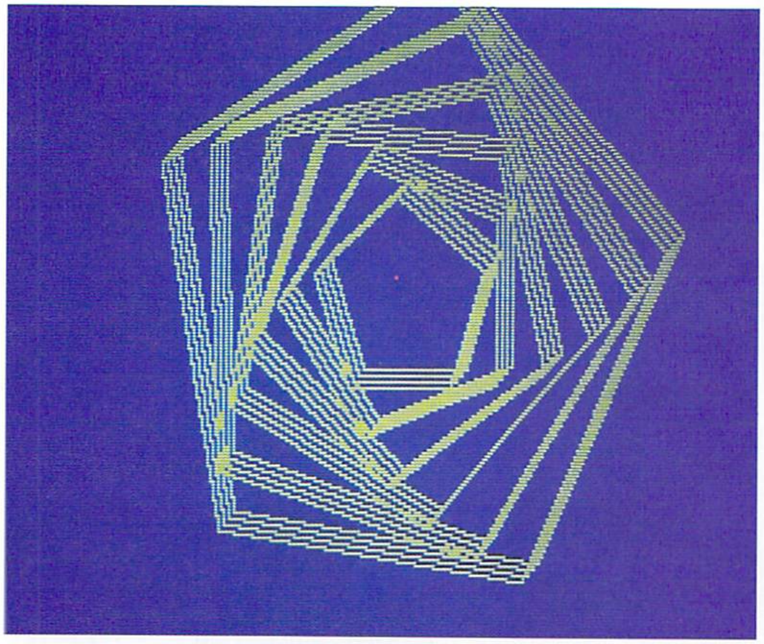


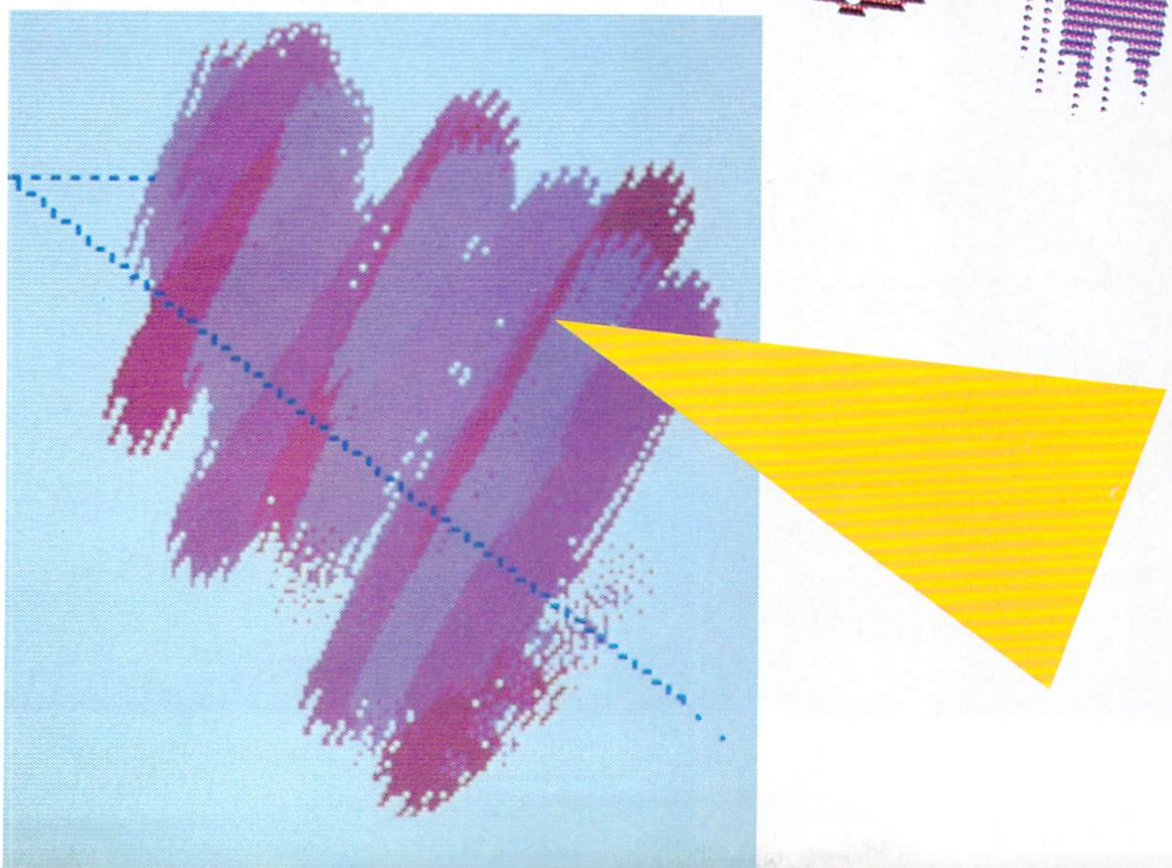


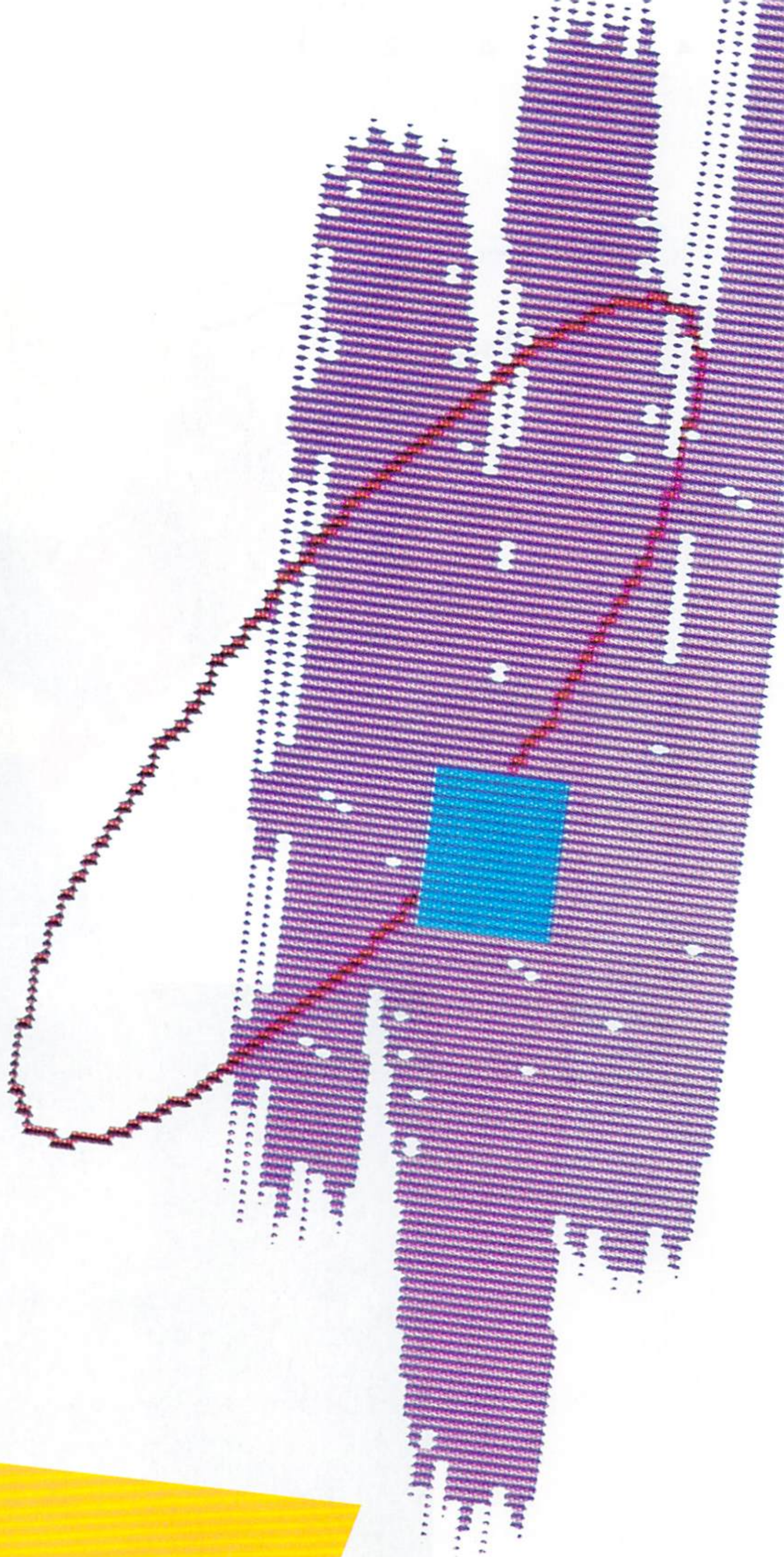
Above: Example of various brushes, freehand drawing and ellipses showing thicknesses and shapes. Left: Linear and filled triangles.

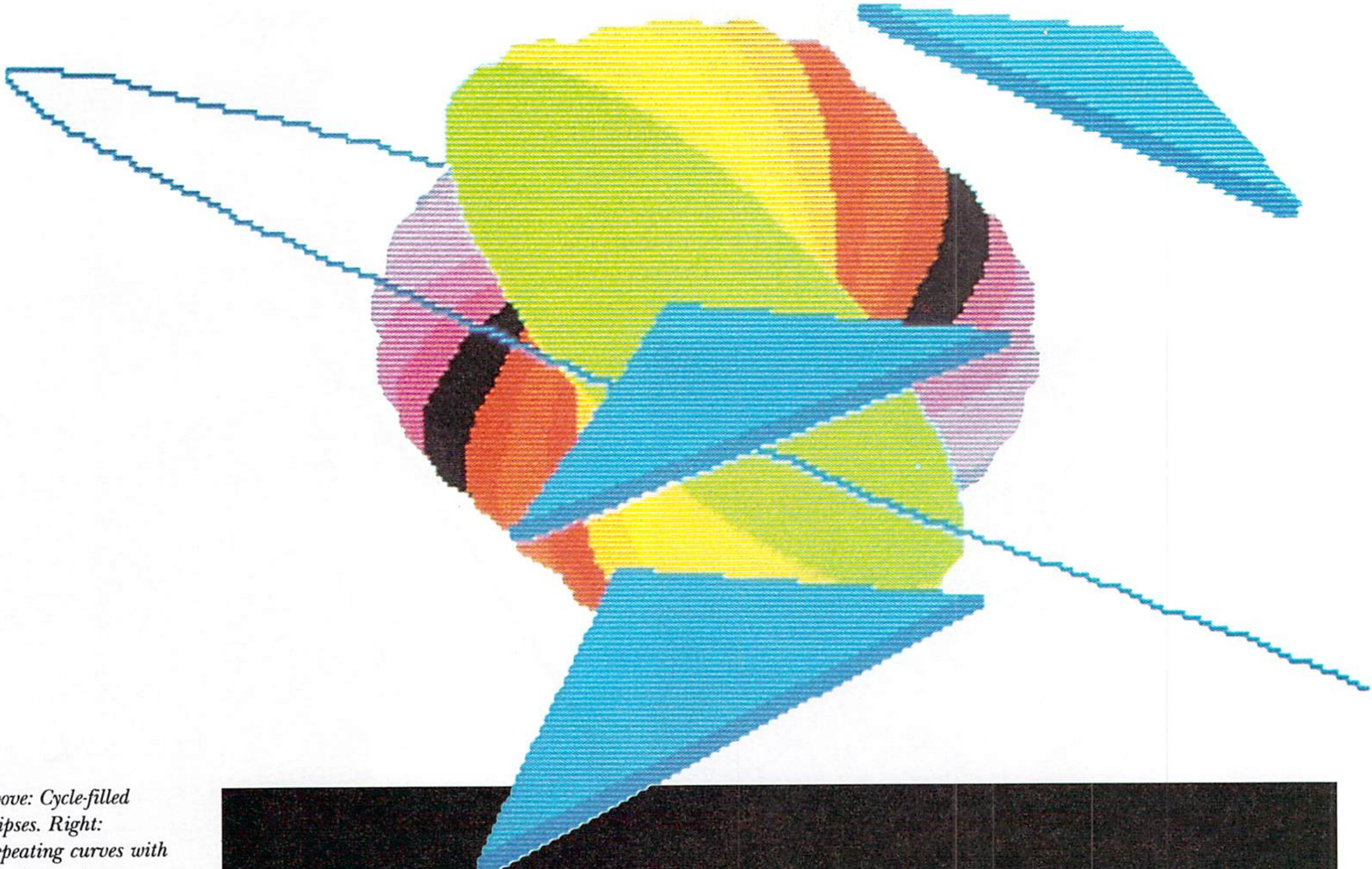


Right: Freehand color cycle using largest brush stroke. Opposite page, top left: Pentagon done with a three-dot brush. Opposite page, bottom left: Color cycle airbrush with dotted line.

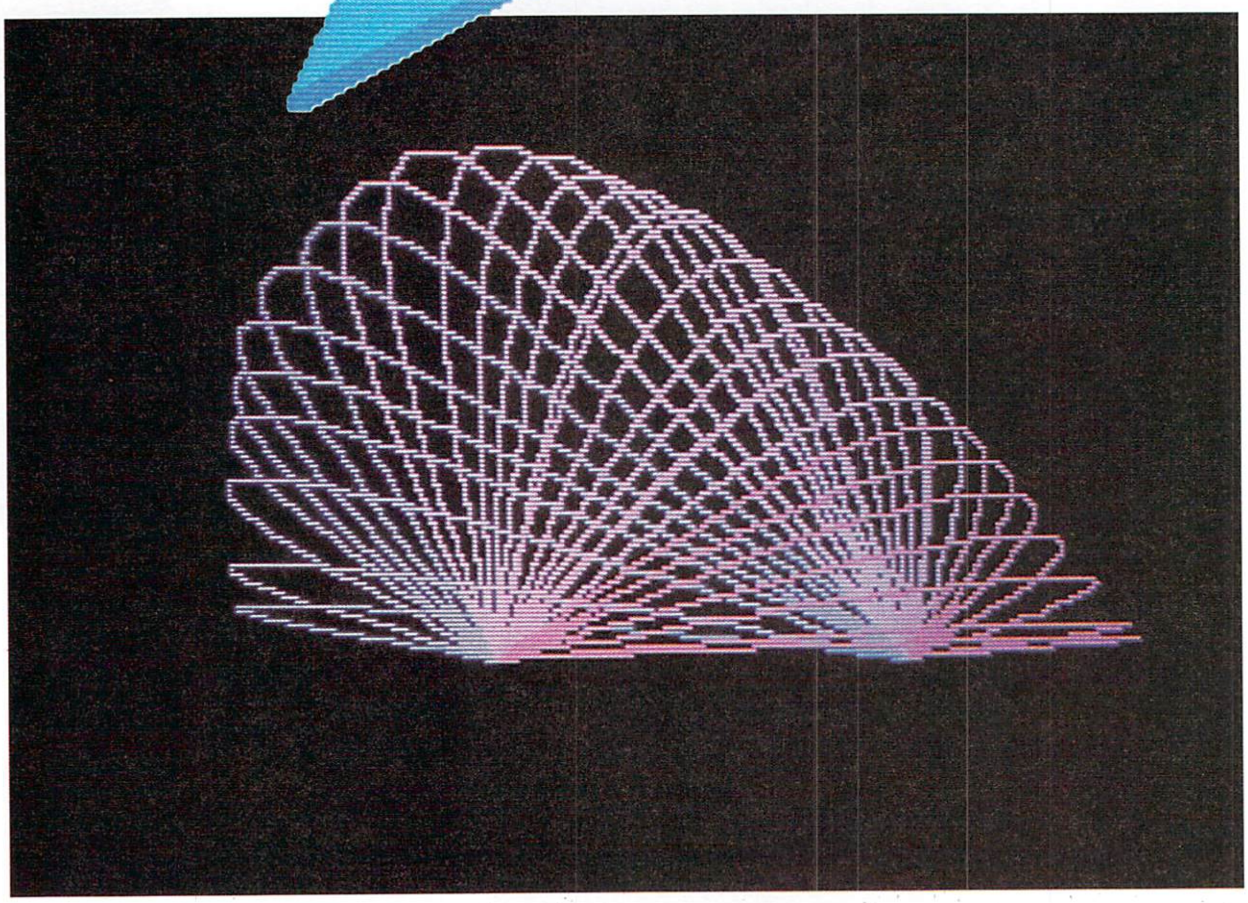


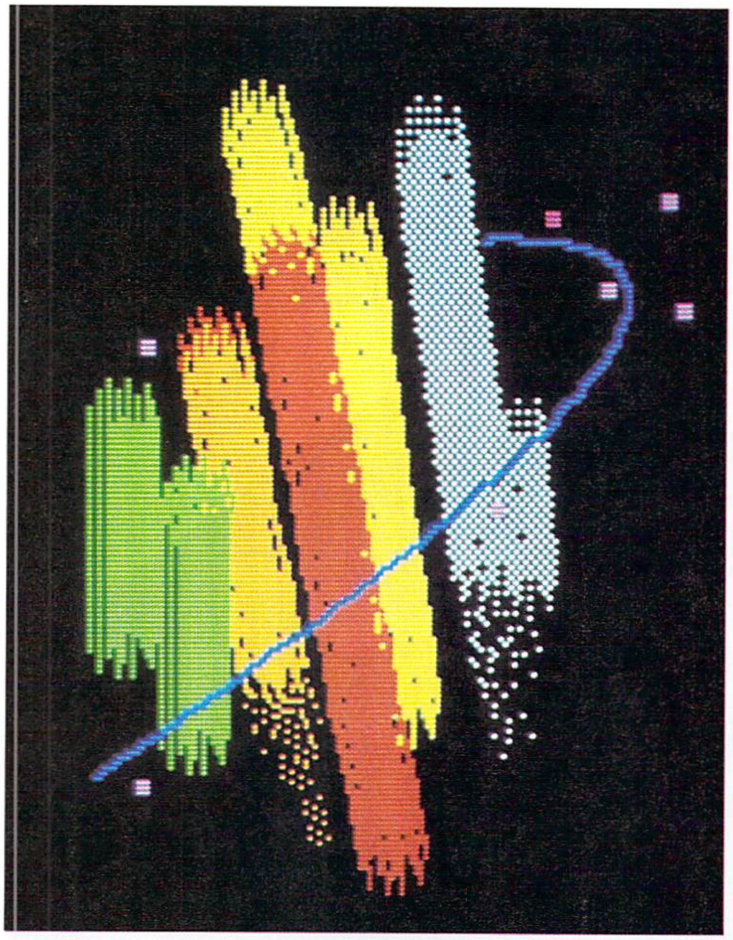


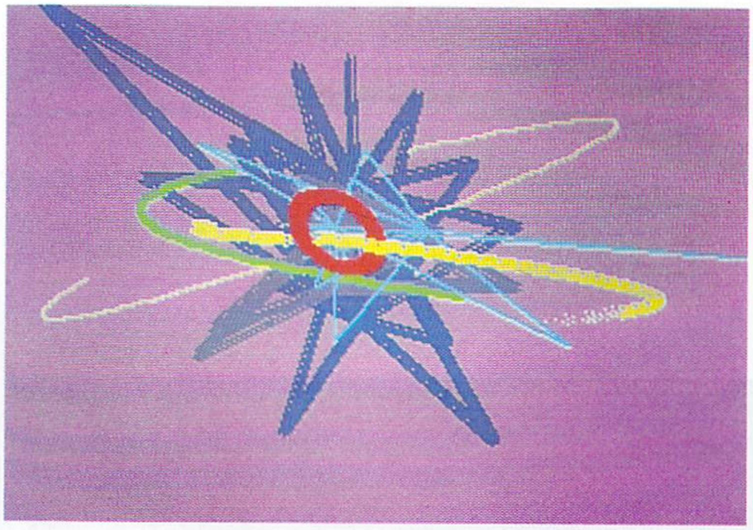


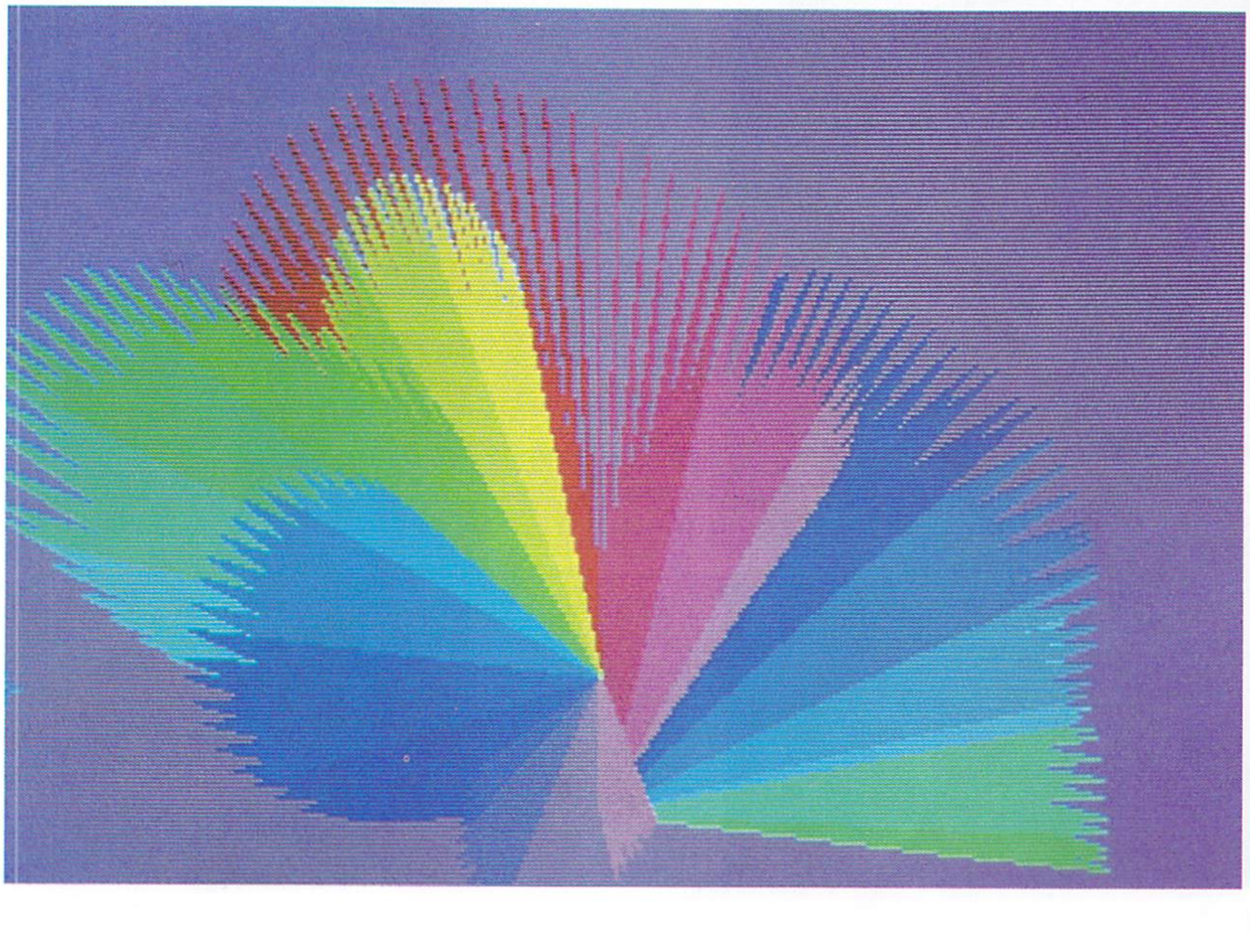


Above: Cycle-filled ellipses. Right: Repeating curves with two fixed points.

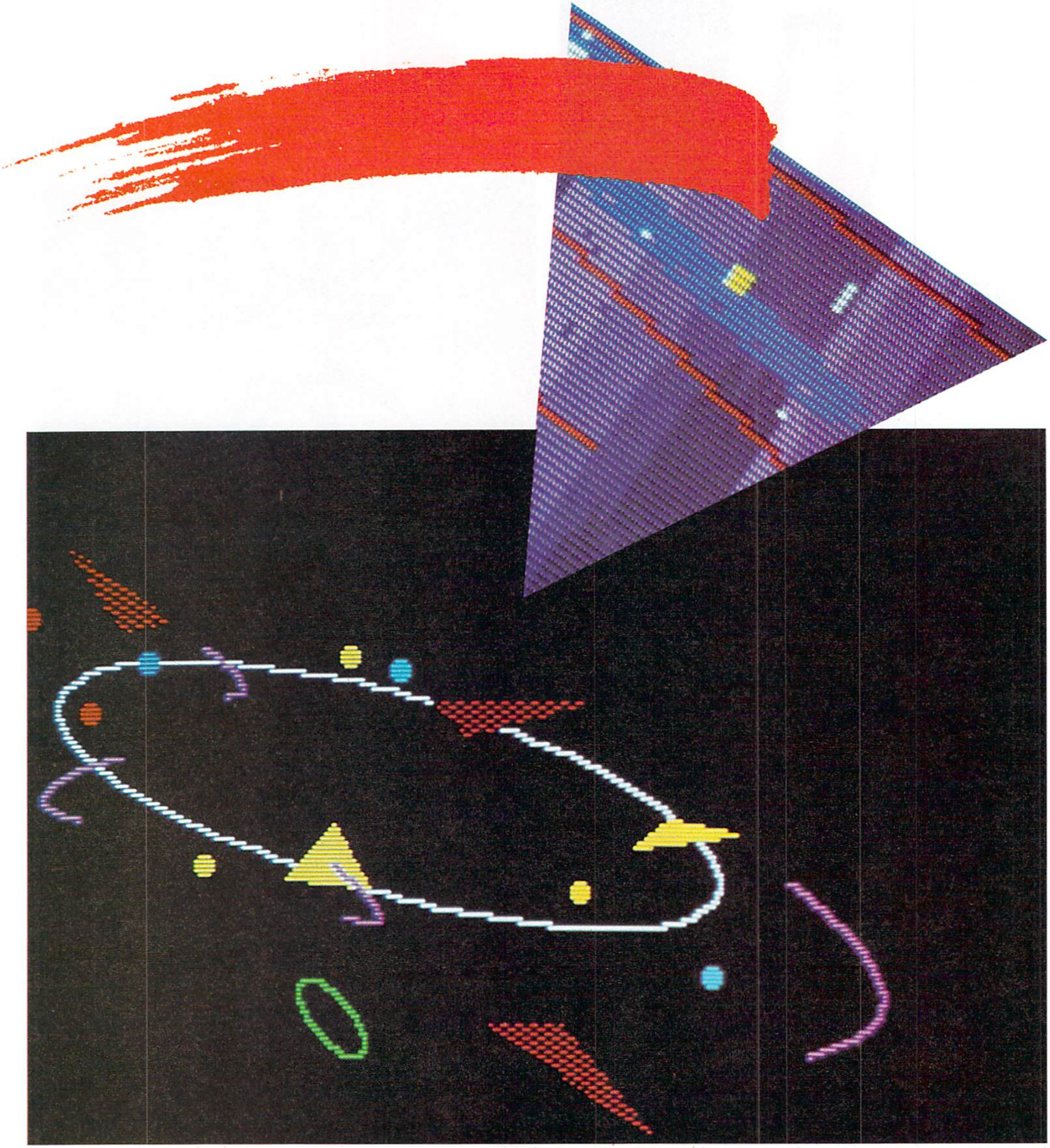


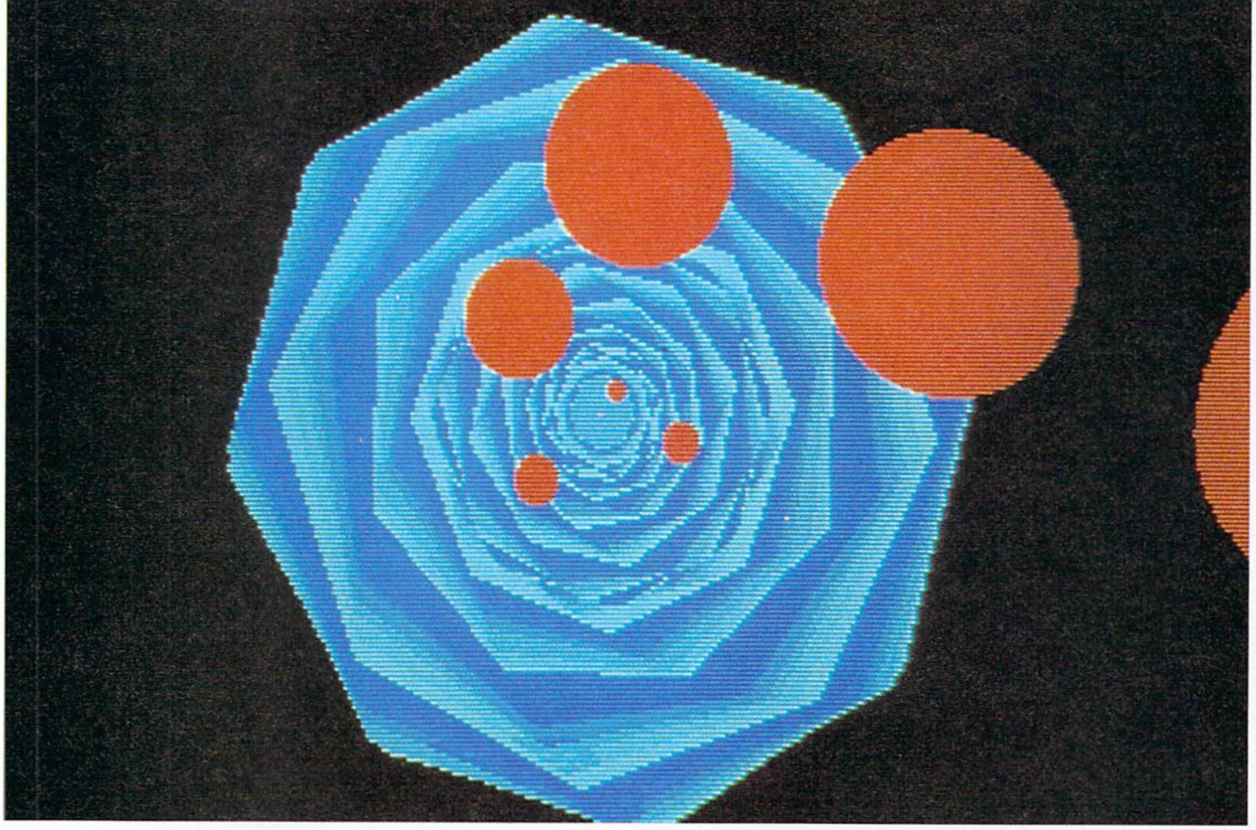


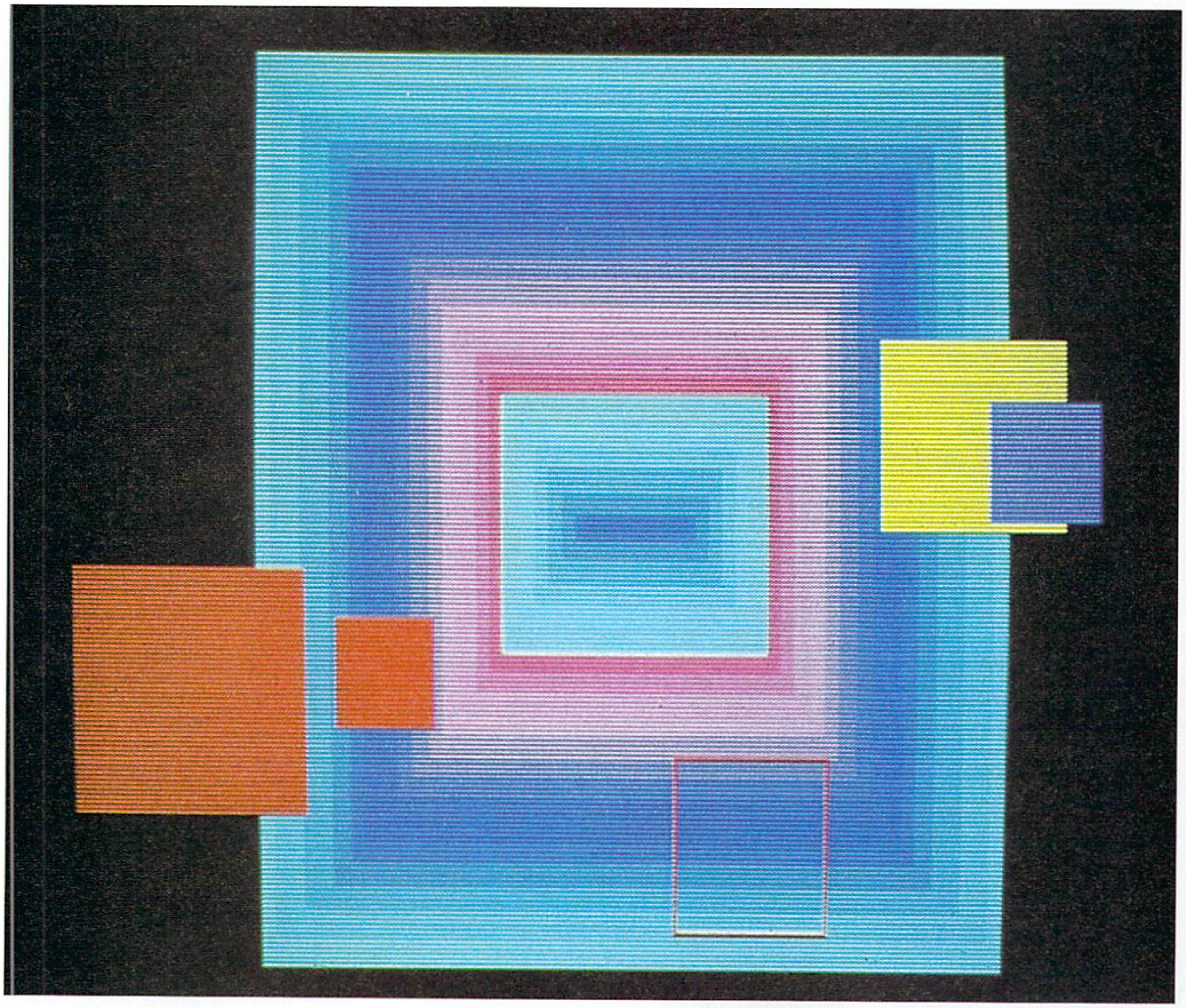




Above left: Largest airbrush strokes with selected colors. Above right: One-point fixed triangles using small airbrush stroke. Left: One-point fixed color cycle filled triangles.

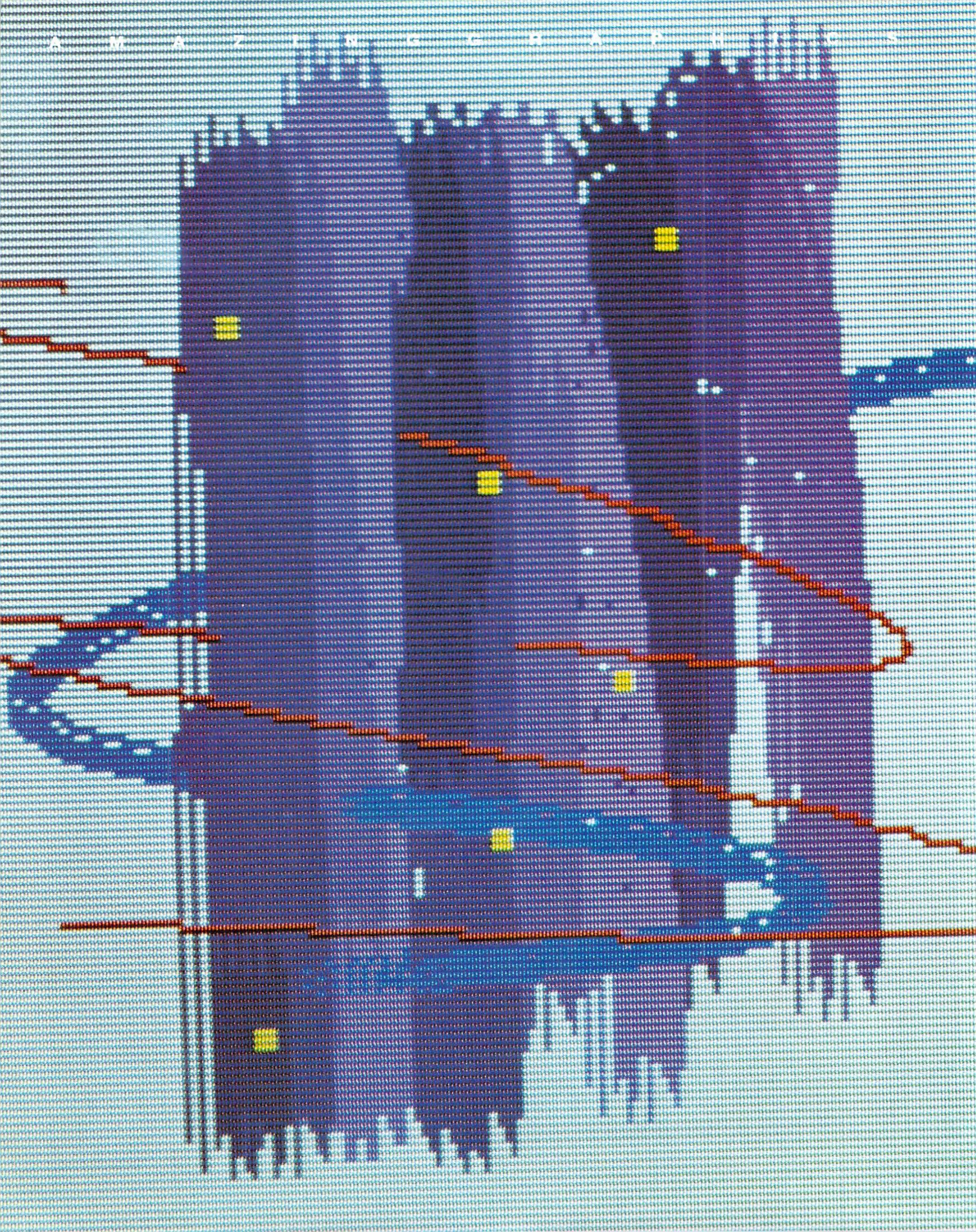


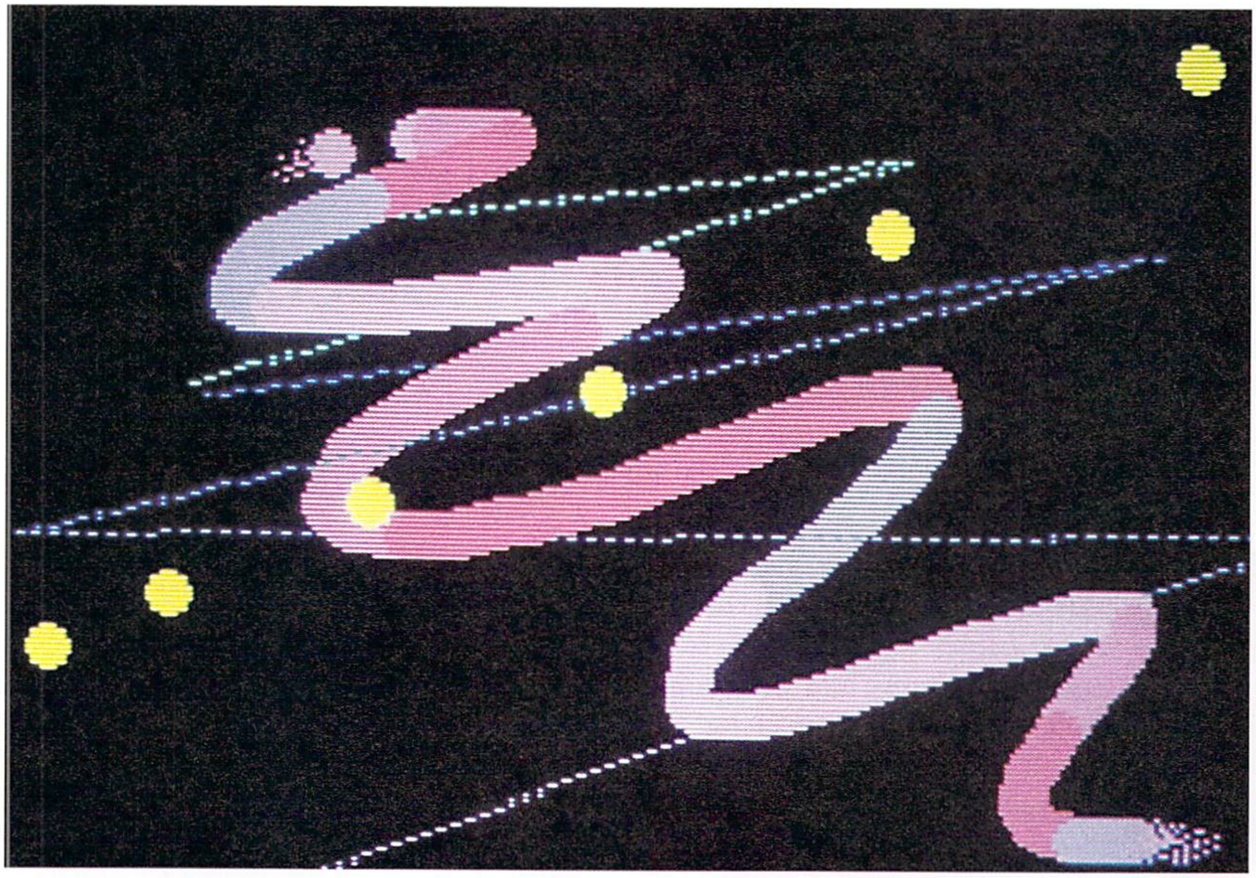


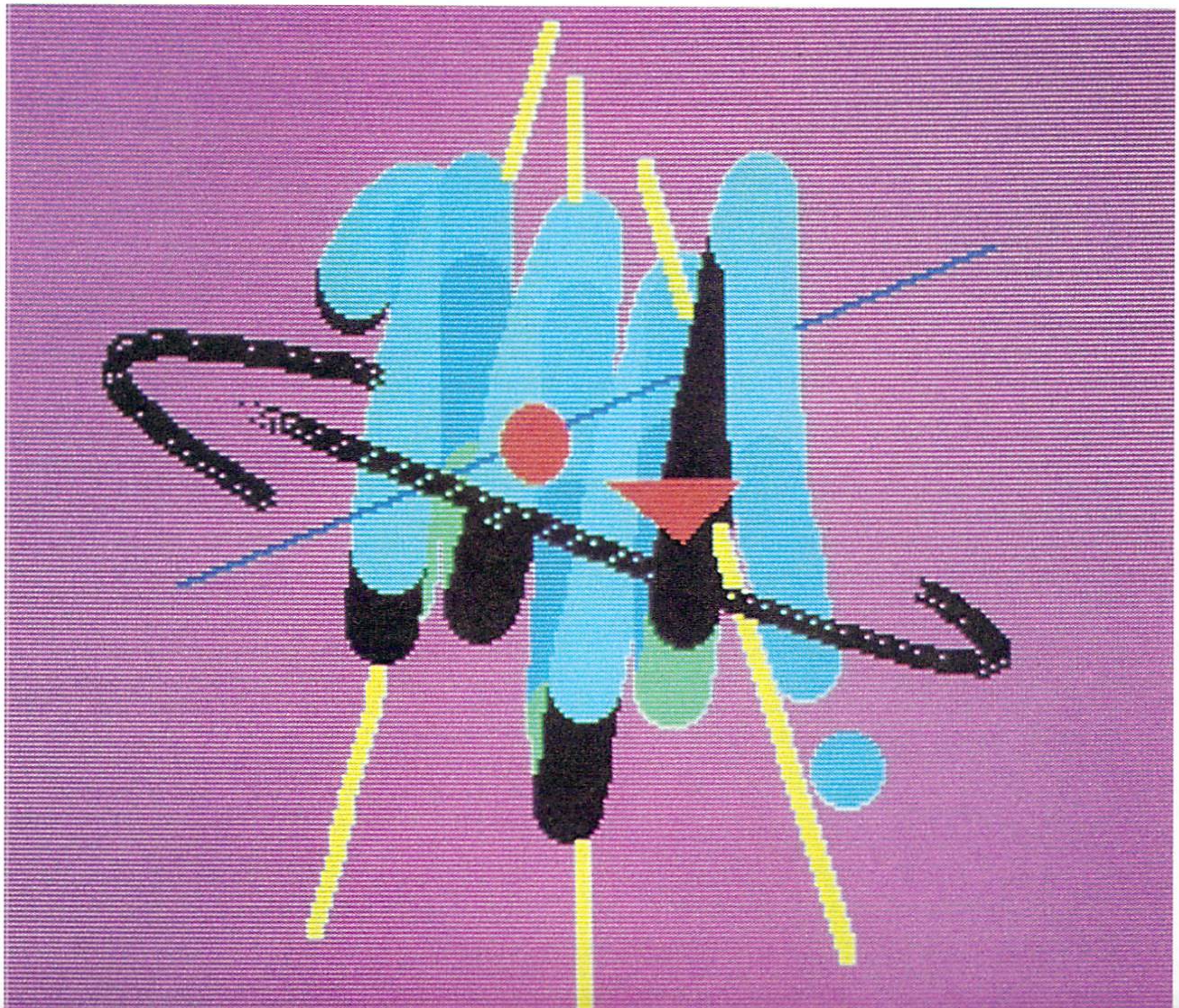


Opposite page, bottom: Beginning to put it all together. This page, top: Octagons with shades of blue color cycling. Left: Color cycle filled rectangles with solid squares and linear rectangle.

►







Opposite page: Overlapping various brush strokes. Above: Freehand drawing with the largest brush stroke and dotted line.

Stimulating Simulations: Electronic Arts Gets Involved with the Amiga

By Jim Forbes

Entertainment is serious business for Electronic Arts, which boasts some of the best Amiga programs and programmers. Find out how the company's unique attitudes and innovative strategies are keeping everyone happy.

How many times have you wondered who programmed your favorite software package? Perhaps you've wondered how long it took to develop your favorite program or how it evolved. In most cases, those questions will remain unanswered, unless you are looking at a program from Electronic Arts.

Electronic Arts, located in San Mateo, California, develops a variety of entertainment and personal productivity software for the Commodore 64, Apple II, Atari and recently, the Amiga from Commodore. According to Trip Hawkins, the company's founder and president, Electronic Arts is dedicated not only to being a highly successful business, but also a place where programmers are thought of as artists. The result: programmers, or artists, have been flocking to Electronic Arts to work on software for the new Amiga.

At a time when "legitimate" software companies, funded with millions of dollars in venture capital, are struggling to carve shrinking niches in the market for "serious business" software, Electronic Arts has been concentrating its efforts on interactive entertainment and personal productivity, and it appears to be doing very well.

The company is best known for games like Bill Budge's Pinball Construction Set and One-on-One, a basketball game. According to Hawkins, a quiet native Californian, "Games are fun. They're what we've built our reputation on and what we'll continue to build our future on. There's absolutely nothing wrong with coming home and playing games on a computer... I think the Amiga is the best computer I've ever seen for entertainment."

Apparently, both the programmers under contract to Electronic Arts and the customers agree. Repeatedly, games produced by a varying staff of artists, backed by the administrative talents of Electronic Arts personnel, have found their way to the top on lists that record the sales performance of various software packages.

Therefore, it's not surprising that Commodore turned to Electronic Arts early this year for innovative programs that would educate and entertain and help sell the Amiga to consumers who want a computer for creativity and productivity.

New, inexpensive disk-based entertainment software for the Amiga will shortly be on shelves throughout the country. Hawkins proudly points to a list of 11 existing programs that are nearing completion and promises at least four others within a few months. Some of the current titles being packaged for the Amiga include: Archon, One-on-One, Seven Cities of Gold, Skyfox and Starflight. New titles include a variety of cockpit adventure simulations with graphics and excitement that exceeds arcade machines.

The programmers who are joining Electronic Arts to work on the Amiga are "serious professionals," says Hawkins. "They view development for the new machine as an incredible challenge. It's a lot more complex than a Commodore 64 or Apple II, but it has the types of features that many programmers have wanted for a long time."

The need for recognition, as well as the challenge of working with a new personal computer, are definite incentives to working for Electronic Arts. However, most programmers who work there seem reluctant to admit they were attracted by the prospect of being treated like a "star." Instead, they cite as their main attraction a quiet type of professionalism in which they can better concentrate their efforts.

Bill Budge has been under contract with Electronic Arts for two years. He says, "the company has good people and a vision that I share. But more importantly,



The Development Team. Back row standing: from left to right: Mike Wallace, Dan Silva, Eddie Dombrower, John MacMillan, Steve Hayes, Jerry Morrison, David Maynard; Back row seated, from left to right: Dave Boulton, Glenn Tenney, Jeff Johannigman, Anne Westfall, Jon Freeman, Steve Shaw; Seated front: Bob Campbell, Greg Riker

it eliminates the need for me to market, sell, package and promote my own product. This frees me for what I do best—programming. The types of arrangements Electronic Arts has with its contract artists also helps the artists focus on the right products. It acts as a kind of filter for the creative process."

A more recent addition to the Electronic Arts' lineup is Jeff Brown, a veteran Apple employee who worked for the 32-bit Macintosh and Lisa personal computers from the time of their inception. Brown signed with Electronic Arts because they were willing to "bet on people." Brown stops far short when it comes to being called, or treated, like a star. "I'm a craftsman, and I do the best job I know how. I sought them out and they sized me up. Later, they offered me a contract to develop a program for the Amiga that will be known as Music Manuscript. I suppose the real reason I joined their team, though, was because I trusted them and they trusted me."

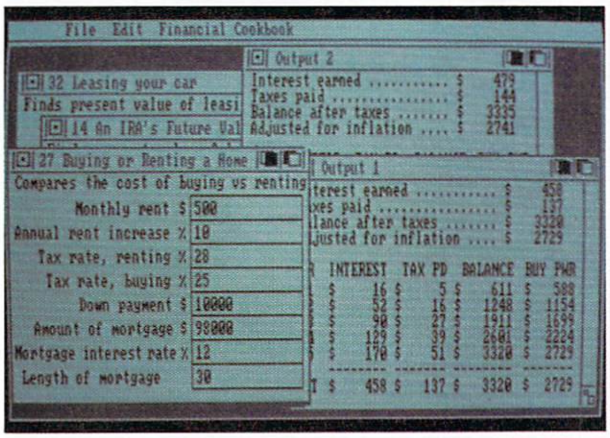
The structure of Electronic Arts resembles that of a record company; a primary goal of the organization is to help the artist make the best possible product. Developers are free to call on a variety of technical, marketing and research professionals whenever they are needed.

On a day-to-day basis, the programmers deal with a producer, who tends to their needs and answers their questions. Each producer handles about six artists, reports Greg Riker, Electronic Arts' Manager of Technology and the man who doles out the precious supply of prototype Amigas.

Riker may understand the record business almost as well as he understands the production of software. Before being recruited to work for a personal computer ►

company and moving to California, Riker spent about five years touring with a band, first as a roadie and later as an acoustics engineer.

Riker gets excited when he talks about the software the company is developing. So far, screen displays and the use of the Amiga's sound chip are, in Riker's view, extremely tantalizing. "The intent of the Amiga's inventors," he explains, "was to rekindle the same excitement that got people into personal computing in the first place. Commodore-Amiga has really succeeded in exciting the developers we work with." Riker also says that a lack of Amiga prototypes may have helped, not hindered, Electronic Arts' development efforts for the Amiga and other future personal computers. Although it wasn't until early this spring that the company began receiving Amiga prototypes—black boxes that do not resemble the off-white units found in retail stores across the country—Electronic Arts was well into development by the time the first developer received the first Amiga prototype.



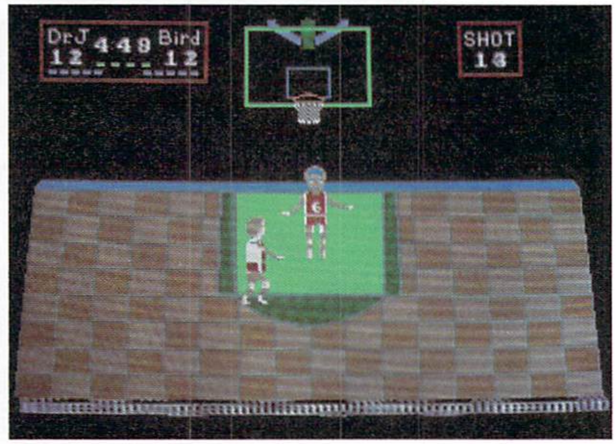
Left: Financial Cookbook. Right: Julius Erving and Larry Bird Go One-on-One.

Riker credits much of their progress to the development of something he calls an "artist's workstation," a combination of hardware, software and peripherals that allows the programmer to develop Amiga software on an IBM PC or compatible.

According to Riker, the workstation concept was developed in an effort to get products quickly onto retailers' shelves and to overcome the need to have extremely valuable Amigas at the office or home of each artist. The concept for the artist's workstation, as well as an extensive library of software routines designed to reduce the time necessary to produce graphics software, premiered at the first meeting of AUGUST, one of several Electronic Arts' in-house Amiga artists user's groups.

There are several versions of the Electronic Arts workstation. The basic unit is an IBM PC with a hard disk, 640K of random access memory (RAM), a proprietary plug-in card, special software, a graphics card and a high-resolution monitor. According to Riker, the systems are worth between $4000 and $9000. If a programmer doesn't already own an artist's workstation, the company will supply him with one and deduct its cost from the artist's advances or royalties.

Some of the electronic "tools" included with the IBM PC workstation include comprehensive software editors and debugging tools necessary to convert code written for the IBM PC's 8088 microprocessor into a compatible language for the Amiga's Motorola 68000 CPU.



Ironically, the screen displays of a $9000 IBM PC AT (used in the artist's workstation) have less graphical resolution than the weakest mode of the Amiga.

When development is nearly complete, the producers supply their artists with one of the Amiga prototypes that seem to be in constant demand by Electronic Arts software developers. The artists perform the final phases of development on an Amiga.

In the development of Amiga software at Electronic Arts, it is essential that producers and support people stay in close touch with the artists. That's why Trip Hawkins pushed his company to install a large-scale electronic messaging network that artists now access from their homes and offices using modems and the workstations. "We communicate electronically with our artists every day," says Hawkins.

Not only does the network link producers and support staff to the artists, but it also provides the artist with access to a fast-growing database that contains working code for programs that are already running on the Amiga.

"By using the network, artists can access a large software database containing workable code for animation, sound and other software routines, to see how other developers have handled similar problems. This reduces the amount of time and aggravation in developing complex software," says Riker. Artists working for Hawkins' company also routinely share information at weekly AUGUST meetings.

AUGUST User's Group

This user's group meets every Friday. The meetings provide a chance for developers to share their tricks, along with the latest versions of their programs. The meetings are also a good opportunity for developers to momentarily duck away from the intense pressure of writing Amiga software code and play other people's games.

Bing Gordon, Electronic Arts' Vice President of Marketing, attends most of the meetings. He has watched the conception, birth and packaging of a number of Amiga programs and reports "artists are incredibly excited about what they can do with the Amiga. The com-

Multi-tasking



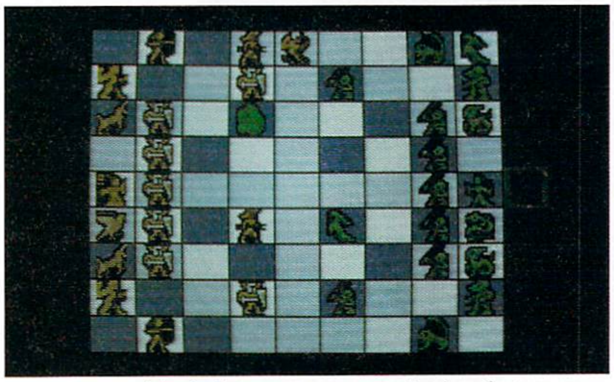
AMIGA™

bination of its central processing unit, custom circuits and graphics capabilities opens up a whole new era of computer game opportunities."

Seated around a table, the authors of programs such as Hard Hat Mack, Robot Odyssey, Summer Games, Sword of Kadash and Get Organized, are openly excited over a chance to develop for what some AUGUST members call "the next wave of personal computers."

According to Gordon, Mike Posehn, the author of Get Organized, is typical of Electronic Arts' Amiga artists. Posehn wrote Micropro's (the developer of WordStar) first text editor and holds a doctorate in computer science. He is working on a program that is known internally at Electronic Arts as "Video Construction Set." The program, which Gordon thinks will be priced well below $100, lets Amiga owners create programs similar to video recordings, using combinations of animated text and graphics.

Posehn says the program will be used "to build little videos that are just like animated movies. The program lets you use the Amiga like a television production



Left: Archon. Right: Return to Atlantis.

company and includes an on-screen display that resembles and works like a remote controller for a video recorder."

Bob Campbell, author of Hard Hat Mack, is working on an Amiga program called Instant Music. Campbell, a musician by training and a veteran programmer, thinks the Amiga could open up the world of music to people who lack extensive formal training. According to Campbell, musicians using the program "won't have to compose new rhythmic scales. We provide a high level of support not found in other machines."

The authors of Summer Games are also actively at work on Amiga development for Electronic Arts. They say, "The capabilities of Apple's Macintosh pale when compared to the Amiga. This is a professional developer's environment. There are 25 channels of direct memory access and it supports real I/O commands."

Dave Boulton, the author of Adventure Construction Set, says, "If Apple's software could have merged with Amiga's hardware, Apple would have won the battle against IBM."

Another artist who belongs to AUGUST is working on an Amiga version of Marble Magic, a tremendous arcade game developed originally by Atari's Coin-Op Division in Sunnyvale, California. An arcade version of this game is in the developers' room at Electronic Arts' headquarters. More than a few artists show up for the weekly meetings a tad early to try and beat the machine, which has been set on free play. Gordon jokes that the Amiga version of this game will require a "military-strength joystick."

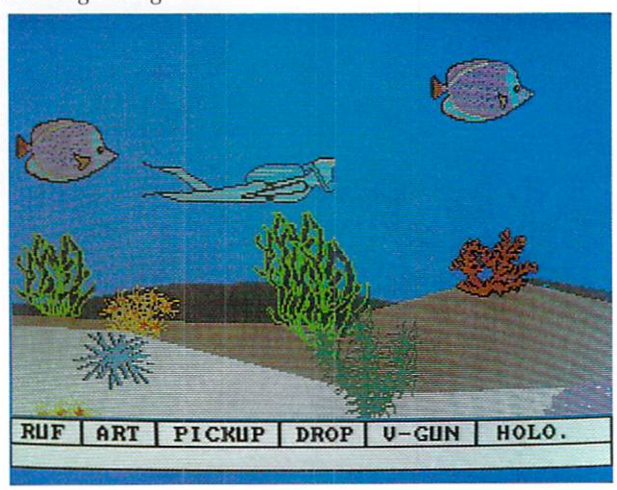
Hawkins points out there is another reason for the AUGUST user's group meetings: teaching old dogs new tricks. "The Amiga's operating system is written in C, a high-level programming language that is very efficient. Most programmers are used to writing games in assembly language. We've used the user's groups to teach the programmers the C language," says Hawkins. The Amiga and its language also help artists provide incredible graphics detail in games and other programs.

Jon Freeman, who, along with Anne Westfall (author of Temple of Apshai), is writing the Amiga version of Archon, says, "In first-generation machines, like the Apple II and Commodore 64, we were able to suggest the shape and texture of fantasy characters. With the Amiga, we are able to show what the figures really are. It's what a personal computer ought to do."

Griffons, phoenixes and dragons instantly take on detailed shapes and hard character in the Amiga version of Archon, as the program shifts from a board-level to a tactical view.

Hawkins freely admits that he's more than a little partial to some types of games. "I really like tanks," he says. "One of the new games involves a tank in Antarctica; the cockpit views will be incredible."

Does Hawkins have any guilt about adults playing games? "All species, including humans, play games well into adulthood. Playing games on a computer usually isn't like watching prime-time television, sitting back and vegetating.



"Look at our game One-on-One. It contains a lot of information about managing people and your own life, and it's a lot of fun to play. Guilt over games? Not really. I enjoy what we do too much," laughs Hawkins. ■

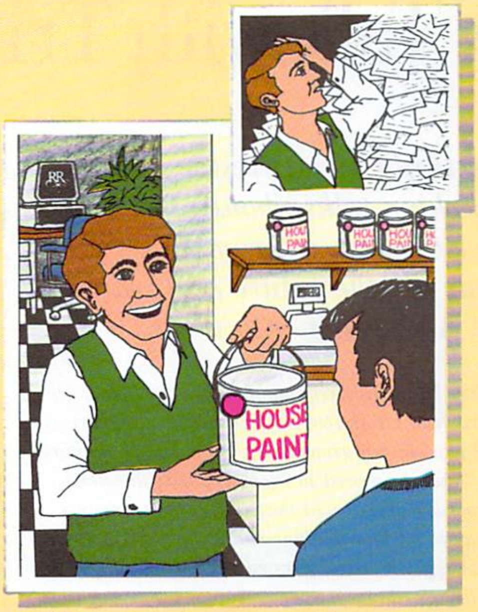
Address all author correspondence to Jim Forbes, c/o Amiga-World *editorial, 80 Pine St., Peterborough, NH 03458.*

"MY OWN RAGS TO RICHES STORY" Chapter 3

(My picture here)

The #1 Reason Small Businesses Use Computers

by ______________________
(My name here)



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News Flash #3

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- Rags to Riches "so simplifies the process of 'keeping the books' that this activity might even become fun," *PC World Magazine.*
- "I was attracted by its simplicity and low price," Stephen Hirsch, Chairman, Inc. (retailer), Chicago Heights, Ill.
- "Before using Rags to Riches, I did my bookkeeping the hard way—by hand," Irene Assaf, Wild & Wooley Yarn Shop (retailer), Palo Alto, Calif.

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A Talk with Trip

Electronic Arts President Trip Hawkins talks about software development, his company's goals for the future and where the Amiga fits into it all.

Trip Hawkins freely admits he loves games. He always has. He started his first games company as a 12-year-old boy growing up in Southern California. When he moved to Massachusetts to attend Harvard, he convinced that university's administrators to let him combine studies in statistics and psychology into—you guessed it—a games major.

After finishing at Harvard, Hawkins went back west and completed a Master's Degree in Business Administration. Not long after that, he went to work for an unknown company still struggling in its infancy. The company was Apple Computer. Hawkins worked in a variety of marketing positions with Apple and eventually headed the marketing efforts for Apple's Lisa. His work at Apple brought him into contact with a number of programmers—contacts that would later prove extremely valuable.

After almost five years at Apple, Trip spread his wings and started his own company, Electronic Arts. Headquartered in San Mateo, California, Electronic Arts is a place where programmers are treated like artists. It is a successful company, with more than a few well-known software designers under contract to develop entertainment and personal-productivity packages for the Amiga. Bill Budge (Pinball Construction Set), Jon Freeman and Ann Westfall (Archon) are all engaged in the Amiga development effort.

Electronic Arts' headquarters is perched on a mountainside in the Belmont Hills. Hawkins' office commands a view of San Francisco Bay. The panorama outside his office is as exciting as the personal vision he shared with AmigaWorld.

AmigaWorld: *Why do you refer to programmers as artists?*

Trip Hawkins: I guess it all starts with the view that the computer is a new medium for home entertainment. The software for other media is produced by artists, so we look at software developers as artists and we think of ourselves as supporting a creative process.

AW: *What is Electronic Arts' mission?*

TH: We want to make software that makes computers worth owning. We're dedicated to finding software artists and helping them to do their best work.

AW: *What types of things will people want in the next generation of games, such as those you are producing for the Amiga?*

TH: They will be the same types of things that people like to read about, or watch on television. People are either looking for fulfillment through fantasy, or they are looking for some new kind of challenge. Maybe they've always wanted to know what it would be like to fly an airplane, or maybe they want to know how to conduct experiments without something blowing up in their faces. It can be just about anything. But, a major ingredient in computer entertainment is giving the user the opportunity to be a hero.

AW: *Are you a hero to software authors?*

TH: If I can help them to make money, I am. In specific cases we have been able to motivate people to go beyond the skills they thought they had. They appreciate that about us. A lot of artists think we are a first-class act, helping them to do their best work.

AW: *Were the people who designed the Amiga aware of the possible long-term effects of their machine on the personal computer industry? I'm referring specifically to the user interface, the graphics and sound capabilities.*

TH: Actually, I think they were the first computer designers who really had the awareness you mention. All the right things are there.

AW: *What are the* right *things?*

TH: The first thing is hardware performance. You have to have a fast processor that is capable of executing compiled code. We have been held back in the past by the limitations of eight-bit processors, which are incapable of handling instructions of the necessary complexity and can only address 64K of memory. On eight-bit machines, to produce a good piece of programming, you have to work in assembly language. This is a specific skill that some people have, but a lot of people who have the artistic ability to come up with great ideas don't have that skill. Therefore, there are some limitations on the kinds of products we can make for computers using eight-bit central processing units.

The Amiga, however, has a fast, powerful central processing unit. With the Amiga, we have been able to provide our artists with developer's workstations that have the right combination of hardware and software tools to develop superb programs.

AW: *Is the Amiga user going to be different from other personal computer users?*

TH: Yes and no. Many of the people who currently own personal computers and have caught the computing bug will want to upgrade to the Amiga. I would estimate that as many as 20 or 30 percent of existing personal computer owners will purchase the Amiga. We went to a Commodore users' group a few months ago and found that most of the people at the meeting wanted to buy Amigas.

AW: *What types of Amiga programs can the consumer look for from Electronic Arts?*

TH: Some of our products for the Amiga will be improved versions of our existing games and productivity software packages. But we are also developing a number of new heroic adventure games for the machine. Most of our packages will be available before the end of the year.

Because the Amiga has incredible sound and graphics, users will find games that have the feel of being much more like real life. They will be able to immerse themselves in the fantasy. This is an important aspect of entertainment software.

What this industry needs more than anything is this kind of excitement. It's been lacking in many games.

AW: *Is there any reason to feel guilt about playing games with a personal computer?*

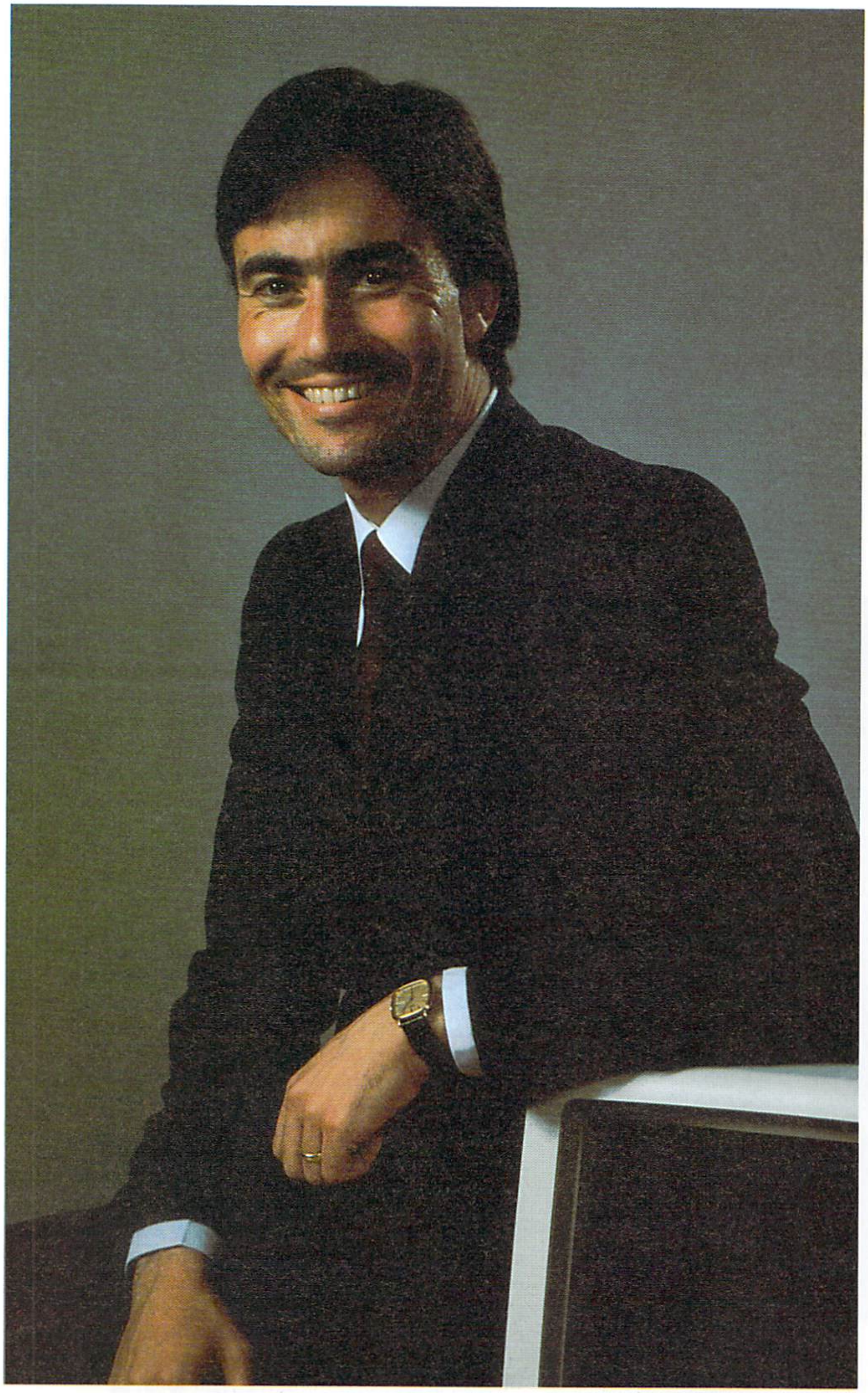
TH: I've always found it interesting that adults feel guilty about playing games. Everyone needs leisure time to relax. Playing games and using an interactive medium like software happens to be one of the more redeeming forms of personal computer usage. It's a form of mental exercise and a learning process.

AW: *Given your perspective on the use of personal computers as an entertainment medium, how do you manage the employees and artists at Electronic Arts?*

TH: The first thing we really believe in is quality. Building the best software is not only a good business strategy—it's really a hell of a lot of fun. We take a lot of pride in what we do. Achievement is also very important to us. We recruit our people with these two values in mind. Teamwork is another thing we really focus on here. Organizational hierarchy doesn't mean a damn thing at Electronic Arts. Having a good sense of humor helps if you're working here. Our software reflects our values.

AW: *What are your future goals for Electronic Arts?*

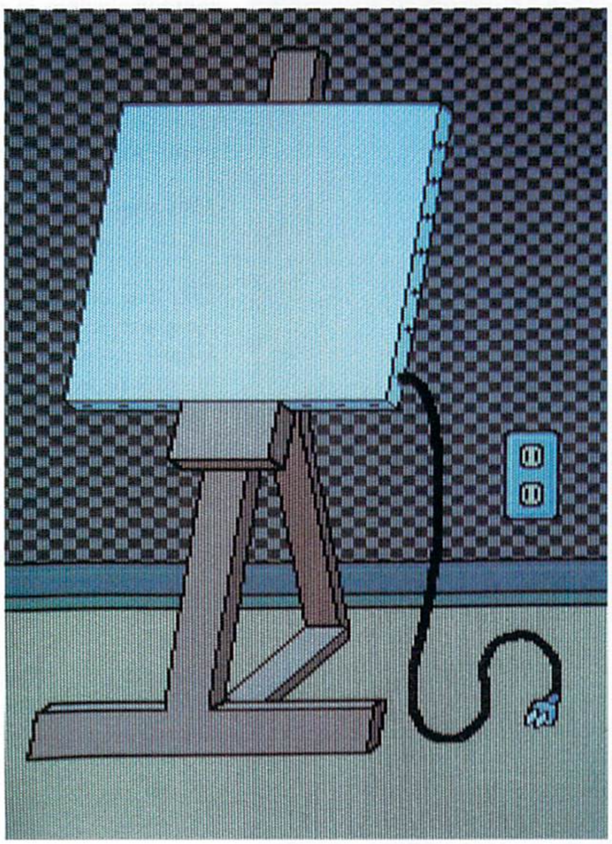
TH: The thing that I find exciting about computer technology is that it is not stable; it has not settled down yet. We want to be the first to figure out how to use new technical breakthroughs like the Amiga to make better software. I think it is inevitable that someday home and personal computing is going to be something that everyone benefits from. Right now it's something that Yuppies—people with money—benefit from. It's at a very early stage. The same place that light bulbs occupied in Thomas Edison's day. But someday soon we will be able to do something with computers that will really affect our lives in an extremely positive way.



Trip Hawkins, President, Electronic Arts

Digital Canvas

The Amiga computer is an impressive graphics tool, but it is still just another computer until it's put into the hands of an artist. Digital Canvas is designed to be a showplace for Amiga artists. For this premiere issue, we convinced Jack Haeger, Director of Amiga's Art and Graphics Department, to do some showing off for us.



Jack is originally from Chicago, Illinois, where he spent two years at Northern Illinois University before going on to get his BFA degree in painting from The School of the Art Institute of Chicago. While attending SAIC, he did some freelance illustrating for *Chicago* and *Playboy* magazines. Through *Playboy*, he found out about a Chicago-based company called Williams Electronics, that was looking for a computer artist. Even though he had no experience with computers, Jack took a job there working on video arcade games. His first arcade game project, Sinistar, was ranked number one in the nation for three straight months. He later worked on Star Rider, Williams' first laser disk arcade game.

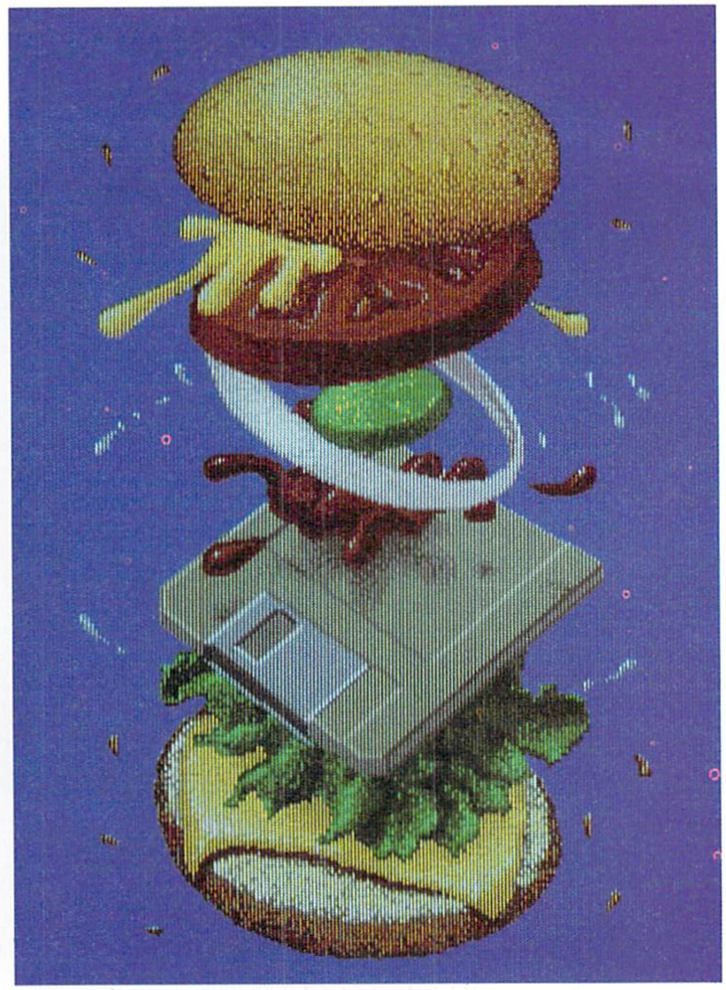
Inspired by the personnel and the machine's promise, Jack took a chance in 1983 and moved to California to work at Amiga, which, at the time, was only a small start-up company. He has been there ever since.

About his own work, Jack says "Up to this point, a lot of computer graphics has been qualified as good simply because it was done on a computer, but that isn't enough. In my mind, it must first stand on it's own as graphic art and secondarily as work done on a computer. You can't just be in love with the media for its own sake. The images must fulfill the fundamental criteria of good design and aesthetics. A sense of humor is also important. I think that the computer is an extremely dynamic tool for creating and manipulating graphic art, and the impact that the computer will have on the graphic world is going to be tremendous."

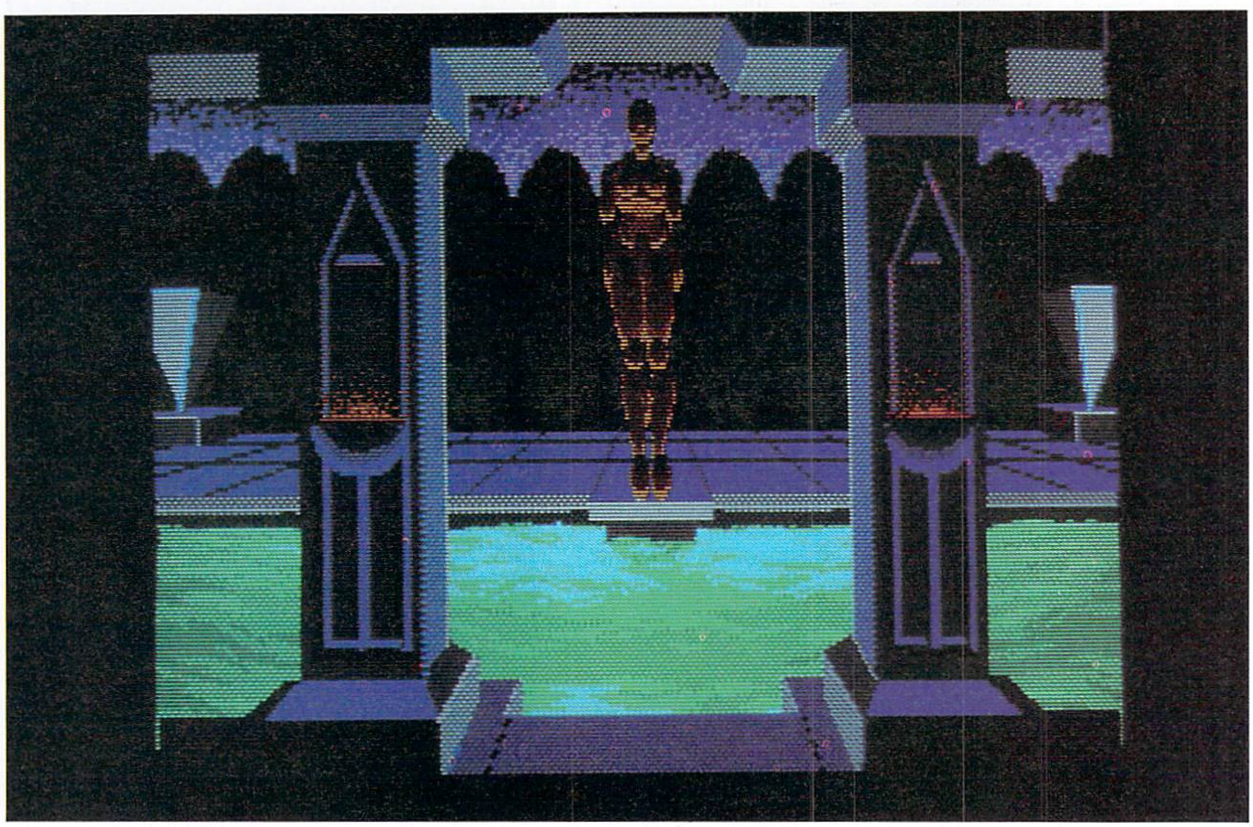
Take a look at some of Jack's work, and you'll see just what an artist can do with the right tools. ■







Previous page: "Self-Portrait." Top left: "Robocity." Top right: "Four-Byte Burger." Right: "Temple." Opposite page: "Girl with a Red Beret."



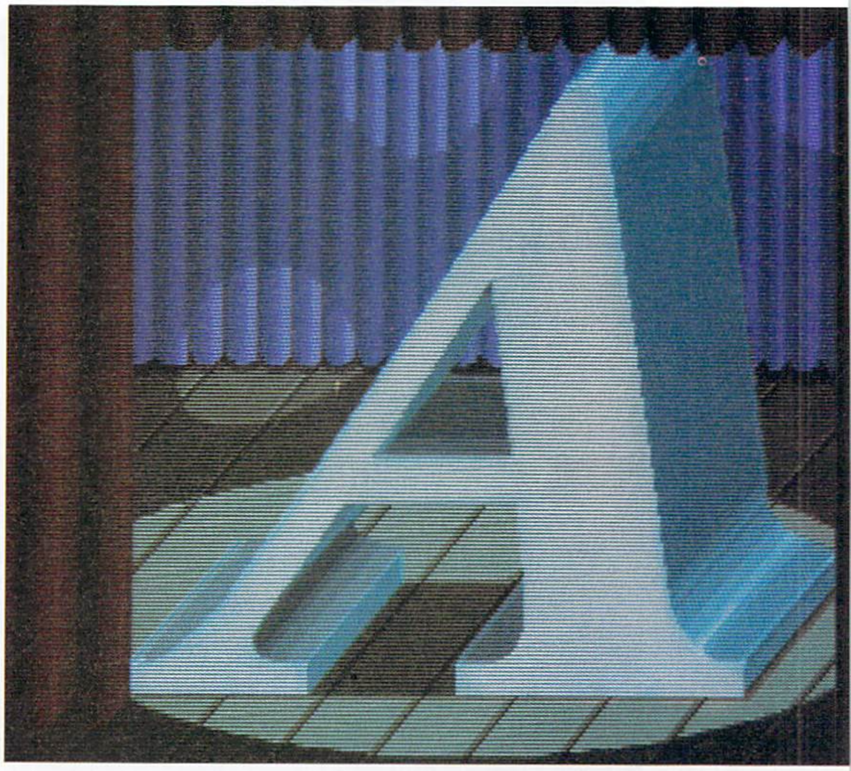


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"A lot of computer graphics has been qualified as good simply because it was done on a computer, but that isn't enough. . ."

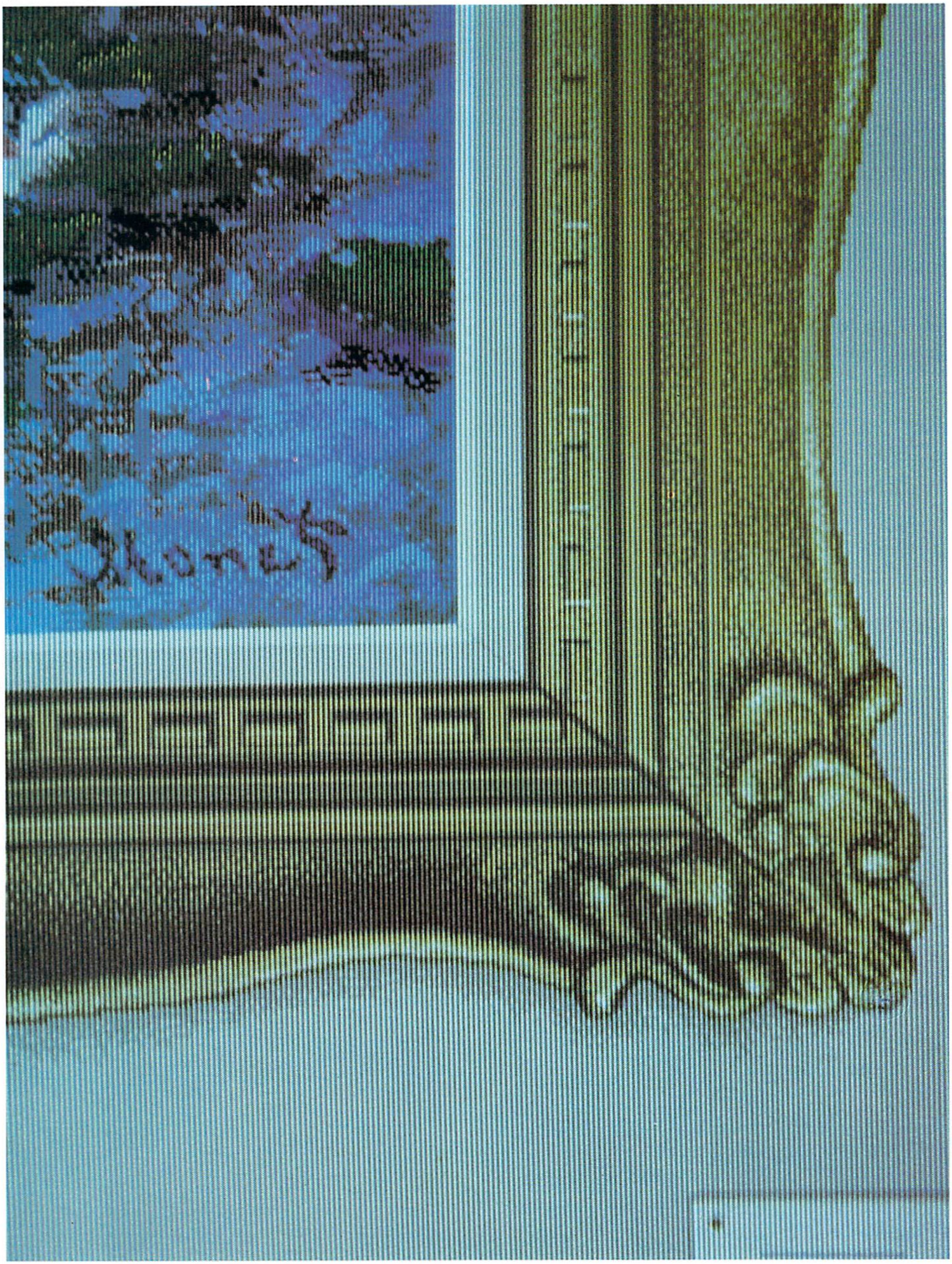


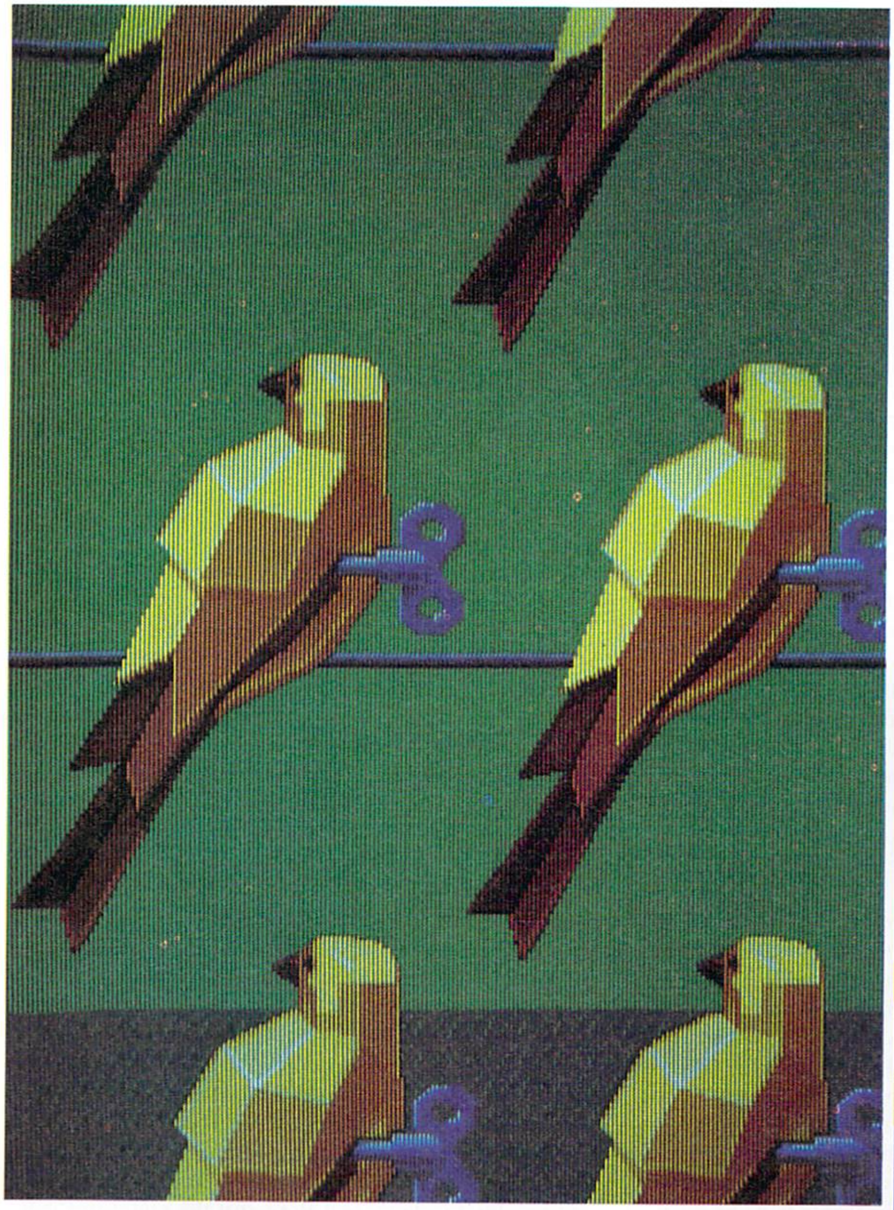


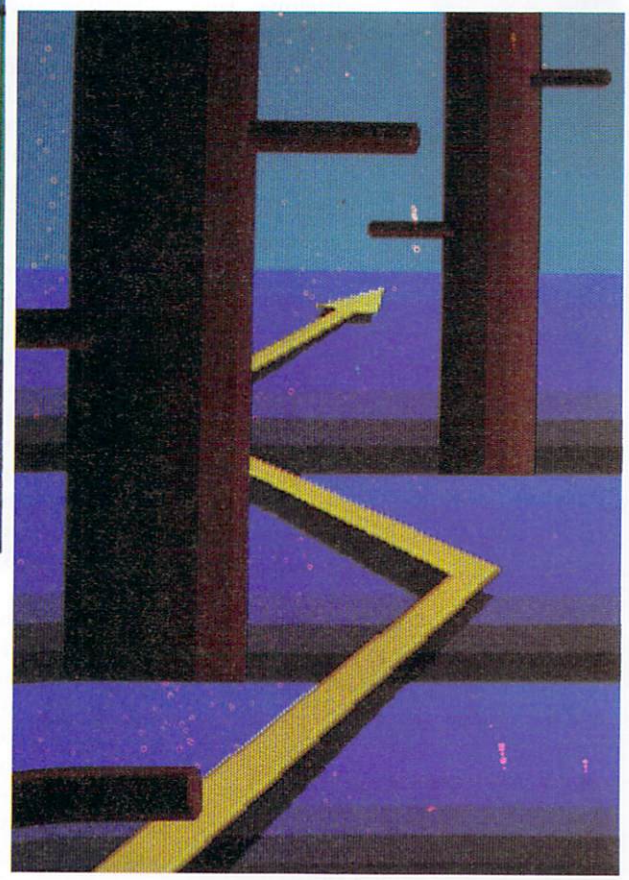




Opposite page: "Music." Top left: "Shapes." Top right: "Introduction to Amiga." Left: "Palette."









Sounds Like

Amiga's sound features can make you a composer or conductor—even if you've never played a note.

Voices, octaves, waveforms, sampled sounds, voice synthesizers, phonemes, attack, decay, sustain, release, envelopes, ring modulation, saw-tooth, sequencers, MIDI, etc. These are the elements of computer music, sounds and speech. If you recognize and understand these terms, then the Amiga is the manifestation of an audio dream. If you *don't* understand them, take heart. There are dozens of music, sound and speech experts out there who have fallen in love with the Amiga. These people are going to make the Amiga sing for you, play for you, talk to you.

It is sometimes hard to believe music and mathematics are closely tied together, but there are people who feel the rhythms of equations, and there are people who calculate screaming guitar riffs down to N decimal places. Some Bach pieces are so mathematical in design that Bach only wrote one or two parts of a five-part harmony, expecting the performer of the piece to work out the relationships, steps and synchronizations for himself. At the other extreme, there have been computerized musical performances based upon the structure of DNA molecules. So what does all this have to do with the Amiga?

When you think of artificial intelligence, images of computers taking over the world pop into mind; or if you are a bit more realistic, perhaps "expert systems" and business decision-making applications seem more likely to you. One company, called Cherry Lane, is using speech-recognition techniques developed at Carnegie-Mellon University by Roger Dannenberg. They are using these techniques in Cherry Lane's latest music software project, called Harmony, for the Amiga.

Harmony is the name of a computerized accompaniment program that is pushing the limits of the computer/music relationship. It's an intelligent program that plays along with you. That doesn't sound all that fantastic on the surface, but check the wording of that last sentence. The computer plays along with you, *not* vice versa. The program "listens" to what you are doing and adjusts itself in real time. It's as though you are playing the lead and another musician is accompanying you on another instrument. If you slow down, it slows down. If you miss a note or two, it doesn't just keep chugging away blindly (or, in this instance, deafly); it adjusts itself to whatever you are doing and tries to anticipate your next move. It follows, rather than leads.

The company is using Harmony as a jumping off point, rather than as the ultimate package. Combined with a scheduled MIDI interface, Harmony can be linked to top-of-the-line synthesizers, keyboards and another of Cherry Lane's existing products, the Pitch Rider, which lets you play an instrument into a microphone.

So even though the Amiga can do a good to great job of imitating a flute, either through true computized synthesis or sound sampling (more on that later), with the Pitch Rider, Harmony and a MIDI interface, you will be able to play a real flute and the computer will follow along. Sometime in the not-too-distant future (can we hope very near to the Amiga's launch date?), you will be able to play music into the computer, have the software write the musical score for you, go back and edit the score, and then, as you play different parts, have the computer play along with you.

Cherry Lane is working on sampled sound software, which will mean the ability to take a sound, any sound, digitize it and then turn it into an instrument that can be played back. For example, you will be able to record the sound of a bottle being broken, and then, after some software chicanery, play a broken-bottle-piano, letting the computer adjust the pitch of each "note." When you touch the middle C key on your keyboard, the result will be the sound of a bottle breaking in middle C; when you touch the G sharp key, the bottle will break in a lovely G sharp.

These are not just the dreams of a music fanatic; these are things that we should all be seeing within months! Whom are they designing for? The profes- ►

Cherry Lane Technologies & The Amiga Personal Computer Join Together in

HARMONY

We are proud to announce the arrival of *Harmony*, the first of a new generation of Cherry Lane software developed for the Amiga. You can now take full advantage of the unique music and graphics capabilities of this powerful computer.

Harmony is the ultimate in music accompaniment. The four internal voices of the Amiga, as well as all 16 MIDI Channels will follow your lead. Every nuance of your performance will be followed brilliantly. You can accomplish *Accelerando* and *Ritardando* at will. Even if you jump ahead or behind in the score, *Harmony* will keep pace.

***Harmony* features:**

- Full Score Graphics with repeat points and scroll bars.
- MIDI Implementation of MIDI In, Out, and Thru.
- Real time accompaniment to follow your performance.
- Recording of your own accompaniments.
- Singers and horn players can use the Pitchrider 2000 and take advantage of *Harmony*.

Optional equipment includes:

- Full size 49 note keyboard.
- Extensive library of pre-recorded arrangements.

Welcome *Harmony*.
The first part of an integrated music composition and performance system for the Amiga.

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sional musician, certainly. With the MIDI interface (a state-of-the-art, high-end music product) and the ability to use the Amiga as a sequence controller during on-stage performances, people in the music industry are already drooling at the potential of the Amiga. But music is a computer language that everyone can enjoy. And the programs that Cherry Lane is working on can be used by the novice as well as the pro.

Other people are working on music for the Amiga, and the first music most people will hear will come from Commodore's Musicraft. The Musicraft program, to be released in October, has features that can tune up a tin ear, edit out mistakes and act as a serious tool for the dabbler and the dedicated musician alike.

The computer plays along with you, not *vice versa. The program listens to what you are doing and adjusts itself in real time.*

Musicraft will feature a sequencer, synthesizer and keyboard. (Now, if someone can only think of a new word to differentiate between a typewriter or computer keyboard and a piano-type keyboard, it will make the job of writing about keyboards a lot easier.) The sequencer section of the program will let you write and edit your music using the mouse or keyboard. (In this case, "keyboard" may mean either type, because Musicraft will accept input from a computer or piano keyboard plugged into one of the ports.) You will be able to write four-part pieces with a range of six octaves, in twelve keys (musical keys like the key of D or the key of G, not the D or G keys on the keyboard) and variable time signatures (if you really want to play something in $\frac{7}{16}$th time, the Amiga can easily accommodate you), assign different instruments to different voices and even change intruments in the middle of a song. The output is, of course, in stereo. There are so many editing commands that Musicraft might be considered a musical note processor (as opposed to a word processor).

In the library of instruments (well over a dozen at the time of this writing, and I expect many more by the Amiga's release date), there are a handful of sampled sounds (mentioned above), and if you have never heard the Amiga in action, then be prepared for a pleasant surprise. The Amiga doesn't sound like an electronic organ trying to sound like an electronic piano. When you ask the Amiga to sound like a violin, it sounds like a violin. Just listen. . . well, anyway, go listen to one and hear what I mean.

Of course, if you don't like the instrument selection included with Musicraft, there is the synthesizer section of the program, where you can design your own sounds or use sounds from the library and modify them to your heart's content. You can alter the envelope, timbre, volume, attack, decay, etc., and when you get a sound you like, save it to disk with the other instruments and build your own Amiga orchestra. There is probably a finite number of possible instruments and sounds that you can create with the synthesizer, but it would be safe to say that the Amiga can create more sounds than the human ear can distinguish (literally thousands, if you want to get picky).

Put these features together with the Amiga keyboard and you have a sophisticated musical instrument unlike any you have ever heard. Musicraft, as mentioned, can be played with a piano keyboard attached, or you can "type" the notes using the Amiga keyboard. You can redefine the computer keys to suit your fancy or your fingers (very handy if, like me, your fingers aren't as musically inclined as you would like them to be). Just redefine the keys so that out-of-key tones just aren't possible, so that your fumbling fingers couldn't hit a wrong note even if they wanted to. You can play along with your own compositions or load in one of the pieces in the score library on the disk (each with its own keyboard layout), and play along with perhaps a greater composer.

There are thousands of other things to talk about, including speech. With the Amiga's built-in speech capabilities, using a phoneme-based system, you will be able to make the Amiga talk in either a male or female voice. You will be able to enter text strings in Basic and have the Amiga recite the Gettysburg Address, or your sister's address. It is almost certain that software companies will have the Amiga read you the instructions for operating a program, or give you auditory prompts. The advantage of phonemes, which simply means phonetic sounds (e.g., Uh Mee Guh for Amiga), is that the vocabulary is unlimited. With a bit of fiddling you should be able to make the Amiga speak with a French accent, or even speak French, if you wish. Like the music features, the voice synthesizer will be able to do more than your average computer.

This was not meant to be a comprehensive discussion detailing all the features of Musicraft and the programs from Cherry Lane; it was meant to be a quick look into some of the things that are being done for the Amiga. There will be many other articles covering sound, music and speech in upcoming issues of *AmigaWorld.* We have only tried to give you the opening bars of a symphony.

When I asked the people at Cherry Lane why they were so excited about working on the Amiga, they said that with the built-in sound and graphics and the MIDI interfacing capability, they are convinced that the Amiga will be "the ultimate music machine." Ta da! ■

GSW

Address all author correspondence to Guy Wright, c/o *AmigaWorld* editorial, 80 Pine St., Peterborough, NH 03458.

A Peek at the 68000

By Brian Epstein

The Amiga and Motorola's 68000 chip mark the beginning of a new era in microprocessing. What will this mean for Amiga users? Here's a look at the recent past and a peek at the future.

So what's the big deal about the 68000? Is it the chip it's made out to be—the silicon wunderkind of the early 1980s? Does it mark the end of the eight-bit era, foreshadowing the demise of old friends like the 6502, the Z-80 and 6809? If you're an old-timer of the eight-bit world, you might not like to hear that not only does the 68000 mark the end of that era, but in all likelihood, it heralds the beginning of the 32-bit era.

Farewell to the 6502

Commodore's decision to place a 68000 under the hood of the Amiga was based on its power, 16-bit architecture and the abundance of software already in existence for it (including fast compilers and high-level languages).

The design of the chip lends itself well to such things as compilers. In fact, certain machine-code instructions available to the 68000 are only included for the specific purpose of helping compilers. Instructions with names such as Link and Unlink allow a program to be compiled from high-level source code to low-level machine code with less hassle for the compiler itself. The programs generated this way will execute easier and faster than if they were produced by an eight-bit ancestor. If nothing else, this is the kind of thing that will influence software writers in their decision whether or not to write for the Amiga.

So, not only will the Amiga be programmable at the old-fashioned machine-code level, but also with Fortran, Cobol or C compilers—whatever suits you best. Assuming the writer of a compiler knew what he was doing with the 68000's instruction set, the final code generated should execute with very little overhead or sacrifice in quality of resultant code. This makes it a fair bet that, of the early products that start appearing for the Amiga, something like a C compiler (currently in vogue) will be among the first to be offered. In fact, the architecture of the 68000 determines, as much as the capabilities of the Amiga, the kinds of software tools that will appear for Commodore's newest micro.

The old band of chips like the 8080, the 6502 and even the predecessor of the 68000 itself—the 6800—are now doomed for forever and a day. Of course, everyone suspected their days were numbered as soon as the first 16-bit chips came rolling off the production line, but somehow the 68000 has been the final coffin-master, firmly hammering in those last nails. The new machine demonstrates Commodore's realization of that fact. The Amiga and the 68000 together mark the entry of home microcomputing into the era of 16-bit microprocessing power. This is a long overdue entry (as 16-bit microprocessors have been available for a couple of years now), but one that will probably lead, in the long run, to 32-bit power as microcomputers become more like mainframes.

A Little History

It's interesting to note that Motorola (the manufacturer of the 68000, or MC68000, as its official nomenclature strictly specifies) was in at the start and end of the eight-bit game. It started with the 6800 way back in 1974 in an attempt to improve upon the only existing eight-bit microprocessor unit (mpu) at that time—Intel's 8008. The 6800 was surpassed pretty quickly as other manufacturers joined the fray. Motorola, not to be entirely outdone by the competition, introduced a superset of the 6800—the 6809—in 1978. Despite not being the most successful chip of the eight-bit era (that accolade goes to the Z-80), the 6809 was probably the most powerful of the eight-bit chips. The one thing that could possibly have been improved upon was its speed; its power and instruction set (that is, the instructions available to a machine-code programmer) were cer-

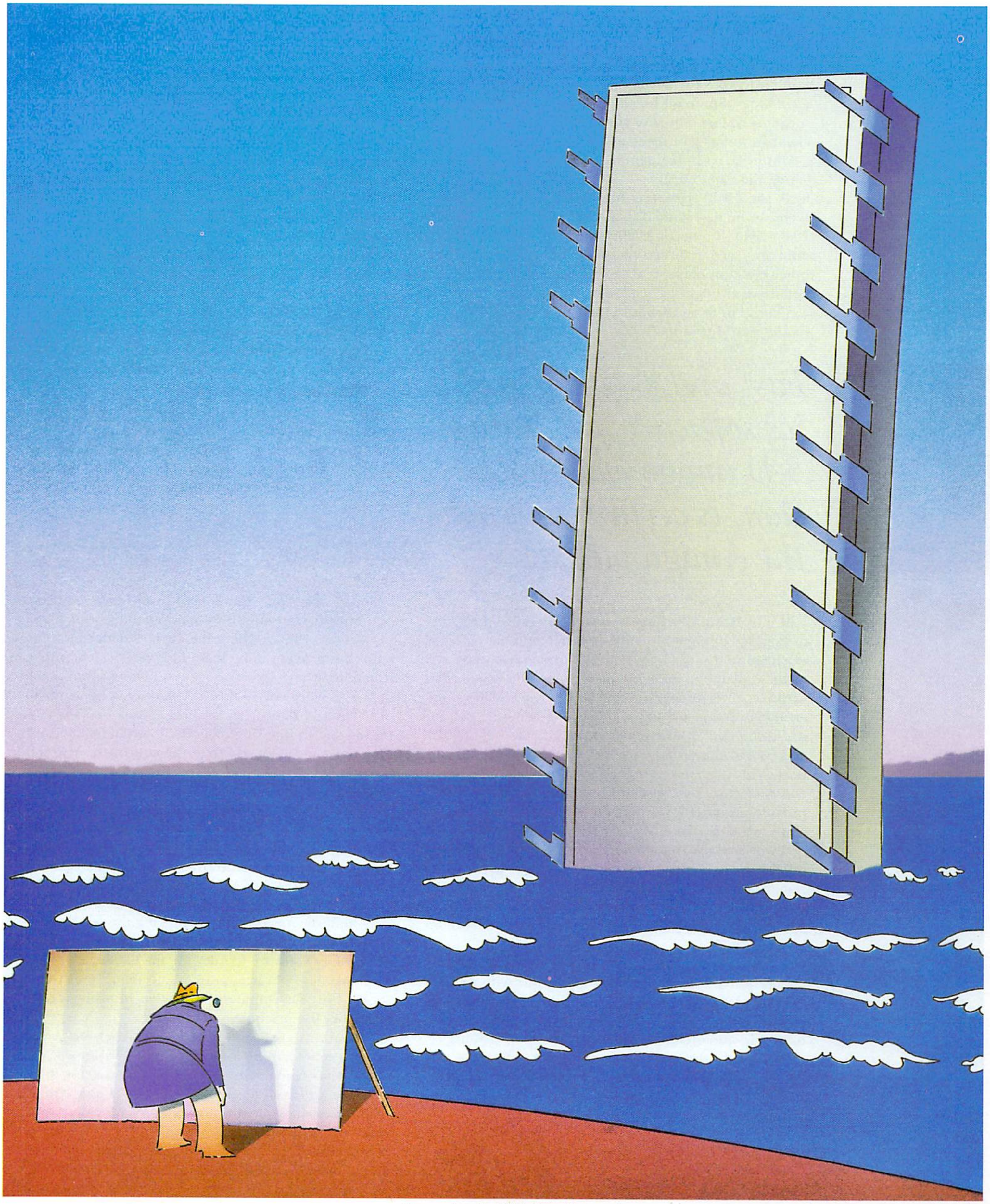


Illustration by Phil Geraci

tainly the most powerful of any eight-bit chip and probably will never be surpassed.

There's no longer any reason why a chip manufacturer would want to devote any time, money or production effort into furthering the cause of eight-bit technology. So, in all likelihood, the 6809 will reign supreme as far as quality goes, whereas the Z-80 will claim supremacy in sheer numbers.

Motorola, with its record of almost starting and finishing the eight-bit stakes, and despite not being the most successful regarding total number of chips sold, seems to be determined to assure its success in the 16-bit field and beyond. The 6809 demonstrated a wisdom and care in design that hadn't been paralleled in other eight-bit chips; that same wisdom and attention to detail was brought to bear when they worked out what was going to be available in the 68000 (which was finally introduced in 1979).

Fast and exciting graphics software, including 3-D image manipulation, is certain to reach the Amiga market.

Motorola was also smart enough to realize that the technology of eight-bit chips couldn't simply be expected to disappear overnight, so the 68000 was even made available in an eight-bit version—the 68008. This works as an eight-bit chip, but it uses the 68000's powerful instruction set and architecture. Not only that, but the 68000 and all its siblings (which include the 68010 and 68020) can actually use some of the powerful support chips that were designed for the 6800. This 6800-family of chips was, of course, originally intended to provide peripheral support on an eight-bit bus. These chips, which are by now fully tried and tested in the real world of microcomputer peripherals, can still be utilized by manufacturers who want to use the 68000 rather than the 6800. This is thanks to a clever hardware trick or two, including special signals and pins on the 68000 chip to allow easy interfacing to these eight-bit devices.

So, now some of the power of the 68000 becomes apparent. Not only is it a microprocessor with a highly developed instruction set, and not only can it support compiled languages, but it also can support a set of hardware add-on chips that have been successfully tested and in the marketplace for years. Thus, the 68000 becomes part of a set of building blocks that can have a computer and supporting software up and running in a much shorter time than would have been the case with the eight-bit wonders of the past.

Four Flavors

As previously mentioned, the 68000 comes in different flavors—four to be exact. The 68008 is simply a 68000 that talks to its memory over an eight-bit bus, just like any "archaic" eight-bit mpu. This is achieved at a small price to speed, because memory is only read at half the "width" of the 68000. The 68010 is a slightly enhanced 68000. It has a couple of extra opcodes that enable it to deal with multi-user environments, and it can run slightly faster. The 68020 is the big daddy of them all. Not only does it have the capabilities of the 68010, but it talks to memory over a 32-bit bus, thus giving it twice the bandwidth of the 68000. This explains the claim that the 68000 heralds the beginning of the 32-bit era: Learn to use the 68000 and you will automatically be able to use the 68020; you will have leapt from eight to 32 bits in a single bound.

Graphics Processing

In its rich instruction set, the 68000 allows transfers of data to be made to and fro between registers inside the chip and memory outside; or, register to register and even memory to memory. The ability to transfer data in so many diverse modes becomes especially important in a graphics-oriented machine such as the Amiga.

Graphics processing in micros has always been a problem in the past because a graphics image is always represented by lots and lots of bits in memory. Lots of bits inevitably add up to lots of bytes, so manipulation of an image translates into manipulation of many bytes in memory. This is where the 68000's data-handling capabilities provide some incredible power. Not only can it handle data in byte-size eight-bit chunks, but it can deal with words of 16 bits in length or long words of 32 bits. The fact that it can swallow 32 bits in a single gulp means that in one single instruction, the 68000 can flex four times more muscle than the equivalent instruction on an eight-bit microprocessor. And that's not taking into account a faster overall speed.

To stay abreast of (and, at the moment, ahead of) their competition, Commodore had little choice other than to go with a 16-bit device to support fast color graphics. As other manufacturers (who shall remain nameless) also picked the 68000 for the very same reasons, Commodore seems to have been preceded by their industry peers as far as making the wisest decision. And as there are already many implementations of graphics software written for the 68000, anybody who has these libraries available to them is spared some of the development headaches in achieving the best from the machine.

Some of this software is certain to reach the Amiga market, so we can be assured of the early appearance of some fast and exciting graphics software for the machine. This will no doubt include 3-D image manipulation, as well as picture processing via a video input.

Within 12 months, many Amiga owners will not only be storing family data on their microcomputers, but they'll also be storing the family photo archive. This

means being able to draw a convincing mustache on your mother-in-law, as well as retouching more important photographs or video images.

The whole scenario of image processing is suddenly going to become available to the hobbyist. Previously, image processing on a realistic level was simply not accessible due to the lack of power of eight-bit processors. Now, with a little ingenuity, hobbyists are likely to be inspired to produce some real works of art. The image processing involved won't be much easier because of the 68000, but it will be fast and impressive enough to be worthwhile. (Watch out for a programmer named Paul Lutus; he did some pretty fancy graphics on eight-bit machines. He'll have a field day with the Amiga.)

A Workhorse

This is all made possible thanks to that 16-bit workhorse, the 68000. Without getting too technical, let me just point out that it has 17 internal registers. Of these, 15 are used on a regular basis. And I'm not talking 16 bits now—each register is 32 bits long. This means the 68000 can hold a graphics image of 15 × 32, or 480 bits. This 15-register's worth of image can be zapped into or out of video memory in a startling 7.5 millionths of a second. This gives you a good idea of why it's the closest thing yet to a mainframe processor in a microchip.

The 68000, because of this power and acceptance within the industry, represents stability and a new beginning within the microcomputer industry that was only hinted at with the Z-80. Commodore couldn't have chosen better. If, as an eight-bit programmer, you've been putting off your entry into 16-bit processing, the Amiga represents your big chance. If the only thing you acquire is a working knowledge of the 68000, you'll be set for at least the next five years in the microcomputer business as a whole. You'll not only be up and running with experience in a 16-bit environment, but you'll also be ready for 32 bits. As the price of the 68020 comes down, it will finally cause even 16 bits to go the way of eight bits. And it doesn't take a great stretch of the imagination to see that the price of microprocessors makes this a certainty.

Facts and Figures

If you're interested in a couple of facts and figures about the 68000, you'll be interested to know that it can access 16 megabytes of memory. Compare this in everyday language with the 6502, which drove the PET, the VIC-20 and the Commodore 64. Whereas the 6502 could address 65,536 bytes of memory, the 68000 can address 16,777,216! This is enough to run the average spreadsheet, database and word processing file all at the same time, with some room to spare. It's also the same addressing range that is available on a measly IBM 370!

Just in case owning an Amiga makes you feel too smug, though, let me tell you that the 68020 can access four gigabytes of memory. Now let me see. . . that's two multiplied by itself 32 times. The batteries in my calculator are due for replacement soon. I think I'll let you work out the final figure yourself. ■

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The Amiga as a Teaching Tool

By Guy Wright

With its versatility, speed and power, the Amiga will enhance and enliven the learning process for a new generation of students—and not just in the classroom.

If you read the projections and surveys about the future of personal computing, you will notice that the trends indicate people will be playing fewer games and devoting more time to business, personal productivity, "expert" systems and educational applications. It can be argued that the Amiga computer is ideal for each of these applications, and some of the other articles in this issue of *AmigaWorld* have explored the ways that the computer can be used in these areas. This article will focus on education, pointing out some traditional—and some not-so-traditional—ways that the Amiga will be used as a teaching tool.

When most people hear the term "educational software," they think of a first-grader sitting in front of a school computer solving simple arithmetic problems or guessing the names of state capitals. They think of drill and practice, for the most part, and when you look at the majority of the educational software out there for the various computer systems, drill and practice is what you find. There are some companies producing educational software of a more interesting nature, and a few companies are marketing some very good programs, but most of the software in this genre is less than impressive. Children in schools learn more by trying to break into the programs so they can cheat than they do by running the programs and following instructions.

There are a number of reasons why the educational software in existence today is so weak. A primary reason is that educational software is not as profitable for a manufacturer as business or entertainment software. One software developer and distributor said that he had dropped his entire line of educational software because the home market was too small, and selling to school systems was a nightmare. As he put it, "School systems are probably the worst software pirates out there. They usually only buy one program and then copy it for each computer lab, then the teachers make copies and the students make copies, and before long, there are dozens of copies of the program floating around. While all this is happening, I am waiting for the school board's approval of the original check. It's like selling them a driver's ed film. You know that it is going to be shown over and over and over again for years to come, but you only get paid for one copy."

Software companies make their profits on volume sales, and schools are notoriously money conscious when it comes to new ideas. Most computer departments spend the little money they have on hardware rather than on software.

Another reason why good educational software is lacking is that the people writing the software are using old methods with a new technology. Few software developers have made use of the interactive capabilities of the computer. Typing tutor programs are the major exception to this; they are an example of how the computer can be used to teach a valuable skill more effectively than a teacher in a classroom (especially if the program is done well).

The Future

So, educational software is in a dreadful state. What does this have to do with the Amiga computer? The Amiga should encourage advancement of educational software art in ways that other computers cannot. The Amiga will put powerful computing, ease of use and features found in no other personal computer into the hands of not only software companies, but also thousands of users. Many will now have the tools to develop sophisticated software of their own without having to learn assembly language to get the speed and special effects they want. The Amiga from Commodore should change the way that we think about educational software. Combined with some of the newer technological breakthroughs, such as CD-ROMs, all the predictions about the future may not be as bleak as drill and practice, drill and practice, drill and practice.

Why is the Amiga going to be any different from any other computer in influencing the way computers are used for learning? The Amiga's features are going to lend themselves to software changes in all areas. The Amiga User Interface is going to make using any program easier and more "self-documenting." As far as I know, there are very few people who think that software ought to be harder, rather than easier, to learn how to use, and as one other famous computer has shown, the mouse and menu system can be much more efficient than banging away at a keyboard. So, learning how to use software will be easier—for business, home and educational purposes. The mouse and menu system of getting information into the Amiga will be much easier for children and adults who have not yet learned to type.

Sights and Sounds

It is easy to see how the sound and graphics capabilities of the Amiga can be used to enhance even the most tedious programs, taking a simple tune played as a reward a few steps further. With the MIDI interface and some of the innovative software that is coming out for music and sound, the Amiga is an ideal computer for teaching music in universities, high schools or any other grade level. From the fundamentals of music theory and scoring to sight reading and band practice. The Amiga will be a valuable teacher for anyone who always wanted to learn how to play a musical instrument, but for one reason or another, didn't wish to hire a private tutor or take lessons. The advances in computer/music interfacing do not limit the instruments to keyboards or synthesizers, either. Audio input devices now let you play almost any instrument into the Amiga, from guitars to flutes. The music and sound capabilities of the Amiga, as creative tools, will also influence film, video and even drama departments.

The graphics capabilities of the Amiga will not only brighten a standard display, but with easy and fast animation, a student can see results in real time. High resolution and multiple colors will give more meaning to images, leaving block-graphics pictures far behind. Learning mechanical drawing will not be a lifelong career.

Animated, high-resolution color representations of machinery, tools, circuits or most anything, combined with mouse-driven software, should cut hours off training time, which means that businesses and manufacturing plants will be looking for a new kind of educational software. It is easy to imagine a line of business training software with titles like "How to Organize a Meeting," "How to Use a Spreadsheet," "How to Write a Business Letter," "How to Compile a Profit and Loss Statement," "How to Plan a Marketing Campaign," etc. Just about anything that is taught in a business school could be brought to the Amiga in one form or another, and with so many opportunities for selling to business, it won't be long before software companies start to announce "business education" software.

The built-in, software-driven speech synthesis capabilities of the Amiga are ideal for teaching languages and reading. There have been programs that have tried to use speech synthesis as a key to learning, but their advance has been hampered by the extra costs involved with hardware add-on synthesizers or unintelligible software-driven synthesizers that try to make the computer do something that it wasn't designed to do. The Amiga was designed to reproduce an extremely wide range of sounds and human voices; it's not child's play, but it's easily within the machine's capabilities.

New Technology

These things are only the start. CD-ROM (Compact Disk-Read Only Memory) is a technological advance that will no doubt find its way to the Amiga. At a recent electronics show, spectators were treated to a demonstration of a CD-ROM player that contained an entire encyclopedia on one nearly indestructible compact disk. No one has to explain the educational value of an encyclopedia, but imagine an encyclopedia, with pictures, fitting inside a 5¼" diskette jacket, which can be accessed in moments. Combine this with a software "course" designed to lead you through a series of the encyclopedia's entries in a logical order and you have a teaching tool like no other.

CD-ROM leads to other teaching tools that the Amiga not only supports, but encourages—interactive video and simulations with a new level of realism. The first interactive videos were presented to the public in the form of video arcade games. One of the first was a graphics cartoon adventure where the player could control the action to varying degrees. The system worked by using the rapid video access of a laser disk player. Various screens were animated and recorded on the laser disk, and depending upon what the player selected, the software controlling the game would jump to that section of the disk in a second or two. There was still a very noticeable delay between action and display of the results, but it was effective enough for one major car manufacturer to use the system not to slash dragons, but to train assembly line workers, using a program where this delay was not critical. On a laser disk, they put real video images of auto parts in every imaginable configuration. The software was designed to train the employee not only how to do things correctly, but also to show them what would happen if they did things incorrectly.

The costs involved in making your own laser disk are still prohibitive, but the Amiga, with gen-locking hardware, will be laser-disk compatible right out of the box. When read/write or write-once laser technology arrives (and this is only months, not years, away), interactive video will be in the hands of everyone owning an Amiga computer. A program that teaches users about the Renaissance artists will bring up video images of their paintings, highlight brush strokes or important features, then bounce around the video disk and quiz you about each one, letting you go backward or forward, zoom in, study or just browse through the paintings at will.

At the heart of the Amiga is a very powerful 68000 chip that can perform complex mathematical operations better than almost any other personal computer. With its multi-tasking abilities and a hard disk, the Amiga will be an ideal computer for setting up a school LAN (Local Area Network). For the serious engineering, physics or mathematics student, the Amiga will be invaluable, regardless of the commercial software available. Computer science students? They won't need any convincing.

The Best for Last

The Amiga will be a key in the future of educational software because of the people who own the machine. The versatility, speed, interfacing capabilities, custom chips, user interface and ease of programming are all going to combine to give even the most casual Sunday programmer the tools of a high-power software developer. (Of course, this means that high-power software developers are going to have tools that no other developers have ever had before.) What would take an experienced assembly language programmer months to accomplish on any other machine can be done quickly on the Amiga using Basic or Pascal. The graphics, sound and animation, being hardware-driven, do not depend on a lot of fancy programming skills. With sophisticated techniques available to those with less-than-sophisticated skills, more and more people will have a computer that will let them write the kind of software that they always wanted to write, but didn't have the knowledge of programming to accomplish. Managers with a little computer experience will be able to write tutorial programs for new employees, parents will be able to write educational programs for their children, teachers will be able to write courseware for any grade level, and the "real" educational software writers will be able to go a lot further than they could ever go before.

If nothing else, educational software will become more and more sophisticated as time goes on, and it will have to run on whatever computer is current and capable. The Amiga is, without doubt, capable of handling whatever a programmer can come up with, and it is a sure bet that the Amiga will be around for a long, long time.

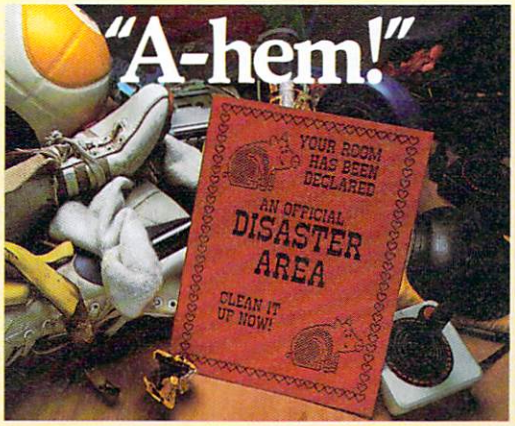
The concept of software in education is not just a child doing number problems on a computer in a classroom—it is an office worker polishing his skills, an assembly-line worker learning how to operate a new machine, an art department offering "computer painting" courses, a businessperson learning a few new tricks of the trade, a grad student learning about the universe, a musician learning a new instrument, a traveler learning a new language, a junior-high student learning how to type and a journalist learning the capitals of the states.

GSW

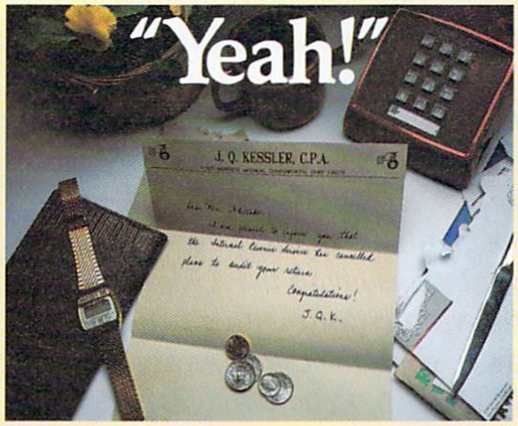
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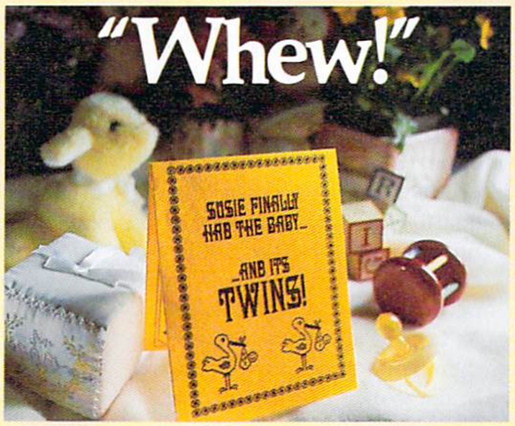
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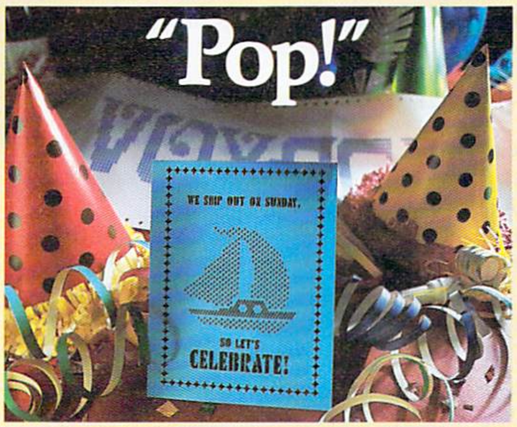
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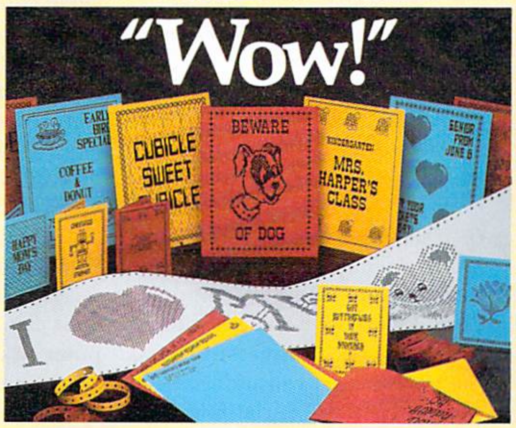
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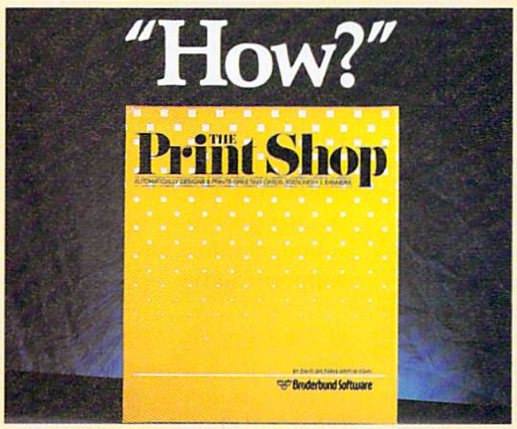
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Help Key

By Swain Pratt

Help Key is a feature that will seek to provide answers to those questions about the Amiga computer that new users or other interested computerists are most likely to ask. The answers will be forthcoming, at least initially, from members of the staff that developed this new computer. Rob Peck, Director of Descriptive and Graphic Arts at Commodore-Amiga, answered the questions in this first installment. If you have questions about the Amiga that you don't find covered here or in other articles in AmigaWorld, *send them in to* AmigaWorld *editorial, 80 Pine St., Peterborough, NH 03458, and we'll do our best to give you satisfactory answers.*

Q: How can the Amiga be described in broad general terms?
A: The Amiga personal computer is a high-performance, low-cost system, with advanced graphics and sound features. We call it the world's first personal supermicro. That's a strong statement, but it's substantiated by the Amiga's capabilities.

Q: How many people were centrally involved with the development of the Amiga?
A: The core of the development staff consisted of about 25 to 30 people, working for nearly two years.

Q: What central processing unit was chosen for the Amiga?
A: The 7.8 MHz Motorola 68000—one of the most efficient and powerful CPUs that exist for microcomputers, and one particularly suited for graphic-intensive applications.

Q: Please describe the Amiga's memory capacity. Can users add external RAM?
A: There are 256K of internal RAM, and users can add on another 256K, using a clip-in cartridge, bringing the total presently possible to 512K, within a contiguous address space of 16 megabytes. Additional external expansion beyond 512K, up to 8 megabytes, is possible, and outside vendors are currently working on expanded memory multifunction cards. There are 192K of ROM, containing a real-time, multitasking operating system with sound, graphics and animation-support routines.

Q: The Amiga has a built-in disk drive. What are the details about this device?
A: It is a built-in, 3½-inch double-sided, double-density drive. The disks are 80-track, formatted as 11 sectors per track, with 512 bytes per sector, giving a total of 880K bytes per disk.

Q: Can other disk drives be connected to the Amiga?
A: Yes; there is provision for connecting up to three additional drives, which may be double-sided, using either 3½- or 5¼-inch floppies.

Q: Is it possible to connect with a hard-disk unit?
A: The hardware and software features of the Amiga fully support hard disk and tape back-up units.

Q: Please describe the Amiga's keyboard. Will it be possible to connect a non-Amiga keyboard?
A: The keyboard is detached, with 89 keys, calculator pad, function and cursor keys. The information about the keyboard output for each of the keystrokes is provided, and if some other manufacturer wanted to produce a more enhanced keyboard with all the Amiga functions on it, I think we would certainly provide all the details necessary for such a connection. As far as I am aware, however, there is no non-Amiga keyboard in the works for this machine.

Q: Can you use a cassette recorder to save and load programs?
A: No, this is not a capability of the Amiga. You can, of course, use a cassette recorder for recording the sounds an Amiga makes.

Q: What about compatibility of various modems with the Amiga?
A: Any standard RS-232 modem should work with the machine. There will be information in the manual that will indicate which pin of the Serial port is appropriate. We know for certain that the Commodore-Amiga, Hayes SmartModem and Tecmar 2400-baud modem will work. In any case, the wiring connections will appear in the back of the manual.

Q: How do you connect the Amiga to a stereo system?
A: On the back of the machine are two ports—audio jacks—for output to the left and right stereo channels from four special-purpose audio channels.

Q: Can I hook the Amiga up to a video tape recorder?
A: The output of the Amiga is compatible with NTSC (National Televison Standard Convention) signals, which means it should be perfectly at home with your standard video recorder. There are ports for simultaneous NTSC composite video and for analog or digital RTV output. In addition to these connections, the system can be expanded to include a VCR or camera interface. The system is also capable of synchronizing with an external video source and replacing the system background color with the external image. This allows for the development of fully-integrated video images with computer-generated graphics. Laserdisk input is accepted in the same manner. This indicates, for example, that you should be able to connect your Amiga in series with your videotape or your camera and use the computer in combination with these accessories.

►



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Q: What languages are built into the Amiga—or planned for the future?
A: A version of Basic is bundled with the machine. Other languages that will work with the Amiga are Logo, Pascal, C and Assembler.

Q: Is the Amiga compatible with any other computer's hardware or software?
A: At the moment, the machine is unique. I can't go into the details here, but we are examining issues of compatibility with certain other levels of software and certain other types of operating systems. At this point, however, the Amiga runs the custom operating system and will do so for the foreseeable future.

Q: What sort of RS-232 output does the Amiga have?
A: You can set it up for just about anything you might want. The connections are specified on the back. We will have a "preferences tool" that will come up under our Workbench program that will allow you to properly configure your Serial port for printers. We can support up to 19,200 baud as far as the transmission is concerned, and potentially even higher than that, if necessary. 31,500 baud is, I think, the top, but 19,200 is the maximum standard one might consider.

Q: What ports are available on the Amiga for connecting peripherals?
A: There's a fully-programmable Serial port that will allow, as I've mentioned, baud rates up to over 31,000; a parallel port, also fully programmable, that's normally configured for Centronics parallel printer output, but that also can be used as a high-speed parallel input port; two reconfigurable controller ports for connecting a mouse, joysticks, light pen, digitizer tablet or paddles; an expansion port with full access to the 68000 bus for adding such accessories as RAM and additional floppy or hard-disk drives; and then the ports for composite video, a second floppy-disk port, RGB and audio output.

Q: The Amiga's graphics capabilities are reputed to be extraordinary. What are the details about these great graphics?
A: The reason for the truly fine graphics is that we have three custom VLSI circuits to provide the graphics—and sound—while still allowing the main processor to run at full speed most of the time. This special-purpose hardware gives you the following features.

The Amiga produces bit-plane-generated, high-resolution graphics, typically producing a 320 × 200 non-interlaced display, or 320 × 400 interlaced, in 32 colors, and a 640 × 200 or 640 × 400 display in 16 colors. A special Low-resolution mode is also available that allows you to have 4,096 colors on-screen simultaneously.

This custom hardware also includes a custom-display co-processor that permits changes to any of the system's special-purpose registers in synchronization with the movement of the video beam. This allows special effects such as mid-screen changes to the color palette, splitting the screen into multiple horizontal slices, each having different video resolutions. The co-processor can trigger many times per screen, both at the beginning of lines and during the blanking interval. The co-processor itself can directly affect all the registers of the special-purpose hardware, thus freeing the 68000 for other general-purpose computing tasks.

The special-purpose hardware embodies 32 color registers, each of which contains a 12-bit number that is split into four bits of red, four of green and four of blue intensity information. This allows the system 4,096 different choices of color for each register. Although an RGB monitor provides the best available output for the system graphics, the NTSC signal has been carefully designed to provide maximum NTSC compatibility. The signal may be videotaped or fed to a standard composite video monitor.

As for sprites, we have eight reusable 16-bit-wide sprites, with up to 15 color choices per sprite-pixel element when sprites are paired, or up to four choices per pixel element when sprites are used individually. The background on which the sprites move independently is called the playing field, and the sprites can be displayed either over or under this background. The sprite is a low-resolution, 16-pixel-wide object that is an arbitrary number of lines tall.

After producing the last line of the sprite on the screen, a sprite processor may be used to produce yet another sprite image elsewhere on the screen. Thus, you can create many, many small sprites by simply reusing the sprite processor as appropriate.

The system hardware also provides dynamically controllable inter-object priority. This means that the system can control video priority between the sprite object and the background on the playing field. You can determine which object appears on top at any given time, as well as sensing collisions between objects or between the object and the playing field.

There is also a custom bit-blitter for high-speed data movement, adaptable to bit-playing animation. The blitter is designed to efficiently receive data from up to three sources, combine the data in one of 256 different ways and optionally store the design data in a destination area. The bit-blitter has a special mode in which it can draw patterned lines into a rectangularly organized memory region at a speed of about one million dots per second.

Q: How can users get a detailed description of the inner workings of the Amiga? Will a hardware manual be available?
A: The hardware manual will be available at or close to the release date of the machine. The same information that has been distributed to our developers will for the most part be available to users. This includes a hardware manual and a description of the operating system's ROM Kernal routine.

Q: Is it possible to damage the Amiga by typing in anything incorrectly, by turning things on or off in the wrong sequence or by plugging in peripherals with the power on?
A: No, you can't damage the Amiga by typing errors or by switching things on or off in the wrong sequence. It is acceptable to plug in joysticks, a mouse or other peripherals with the power on, but we advise that you play it safe by plugging in peripherals with the power off. It's a good practice.

Q: How often is it advisable to clean the disk drive? And how is it best done?
A: Whatever is generally recommended as cleaning intervals—maybe once a month, unless there is very heavy usage. Get a good disk-cleaning kit for a 3½-inch drive.

Q: Is it safe to take the disks through X-ray machines in airports?
A: Yes.

Address all author correspondence to Swain Pratt, c/o *AmigaWorld* editorial, 80 Pine St., Peterborough, NH 03458.

List of Software

Program	*Description*	*Developer*	*Publisher*	*Release Date*
Amiga Assembler	Development tools, including macro assembler, linkage editor and overlay editor for the software community	Metacomco	Commodore-Amiga	Launch*
Amiga LISP *Amiga Pascal*	Programming languages	Metacomco	Commodore-Amiga	Launch
Graphicraft	Entry level, but powerful paint program, giving user control over Amiga's graphics capabilities	Island Graphics	Commodore-Amiga	Launch
Paintcraft	Professional level graphics and art production program	Island Graphics	Commodore-Amiga	Oct. '85
Chartcraft	Powerful business graphics package for charts and graphs. Produces 3-D, shaded, exploded and expanded graphs, plus a variety of special effects for business presentations	Island Graphics	Commodore-Amiga	Oct. '85
Videocraft	Advanced animation effects; ad image-manipulation program using icons and pull-down menus for easy and rapid implementation	Island Graphics	Commodore-Amiga	Oct. '85
Textcraft	Powerful entry level word processor stressing ease of use, on-screen documentation and templates for business letters, memos, etc.	Arktronics	Commodore-Amiga	Launch
Musicraft	Entry level program featuring the Amiga's advanced sound systems and capabilities	Everyware	Commodore-Amiga	Oct. '85
Amiga "C"	68000 C language compiler for Amiga software development in C, a language popular because of its power and portability	Lattice	Commodore-Amiga	Launch
General Ledger *Accts Receivable* *Accts Payable* *Sales*	Small business programs from the popular Rags to Riches series, featuring on-screen documentation, a common command set and the ability to swap data between programs	Chang Laboratories	Commodore-Amiga	Oct. '85
Amiga TLC Logo	Enhanced adaptation for the Amiga of the TLC-Logo programming language for educational applications	The Lisp Co.	Commodore-Amiga	Oct. '85
Telecraft	Easy to use but sophisticated communications and terminal emulation package	Software 66	Commodore-Amiga	Oct. '85
Amiga Harmony	Professional sound synthesis and music program from a leading music publisher	Cherry Lane Technologies	Commodore-Amiga	Sept. '85

Program	*Description*	*Developer*	*Publisher*	*Release Date*
Flight Simulator	State-of-the-art flight simulation program using the Amiga's advanced graphics animation and sound	Bruce Artwick	Commodore-Amiga	Jan. '86
SynCalc	Sophisticated and multi-featured spreadsheet program; data compatible with VisiCalc	Synapse/Borland	Commodore-Amiga	Nov. '85
Mutant	Strategy arcade game	Synapse	Commodore-Amiga	Nov. '85
Enable	Highly acclaimed second-generation integrated package with word processor, spreadsheet, database, telecommunications and graphics	The Software Group	Commodore-Amiga/ Software Group	Nov. '85
Enable/Write	Advanced word processing program for professional users; a module of the Enable package	The Software Group	Commodore-Amiga/ Software Group	Launch
Enable/Calc	Advanced spreadsheet program for professional users; a module of the Enable package. Allows data compatibility with Lotus 1-2-3 (including Lotus macros), dBase II and VisiCalc	The Software Group	Commodore-Amiga/Software Group	Oct. '85
Enable/DB	Advanced database program for professional uses; a module of the Enable package	The Software Group	Commodore-Amiga/Software Group	Nov. '85
BUNDLED WITH THE AMIGA				
AmigaDOS	Operating system	Commodore-Amiga	Commodore-Amiga	Launch
Tutorial	Text and graphics program introducing features of the Amiga	Mindscape	Commodore-Amiga	Launch
ABasiC	Powerful basic programming language with advanced features, such as multiple windows for editing and debugging	Microsoft	Commodore-Amiga	Launch
Amigascope	Rolling demo program featuring the graphics capabilities of the Amiga	Electronic Arts	Commodore-Amiga	Launch
Speechcraft	Speech program with user-definable parameters (male-female voices, etc.) allowing unlimited text-to-speech conversion	Softvoice	Commodore-Amiga	Launch

*Scheduled for release on or before the Amiga's launch date.

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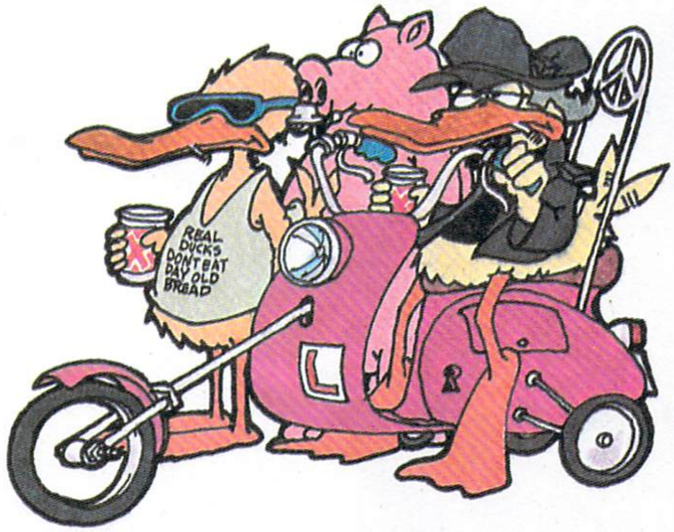
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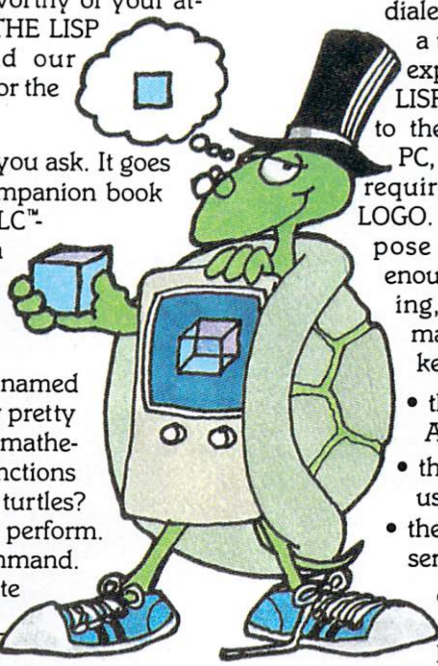


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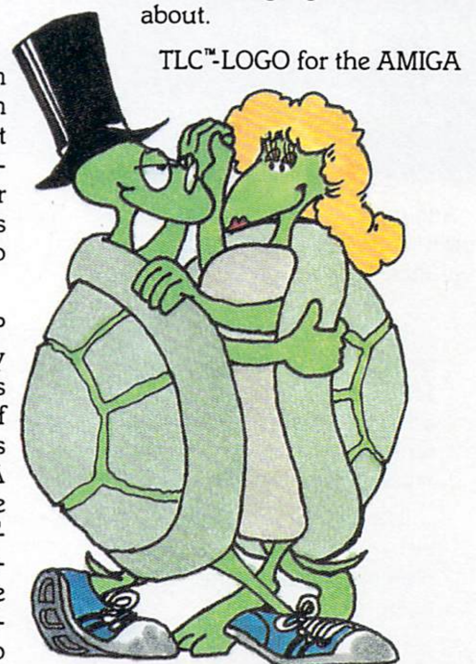
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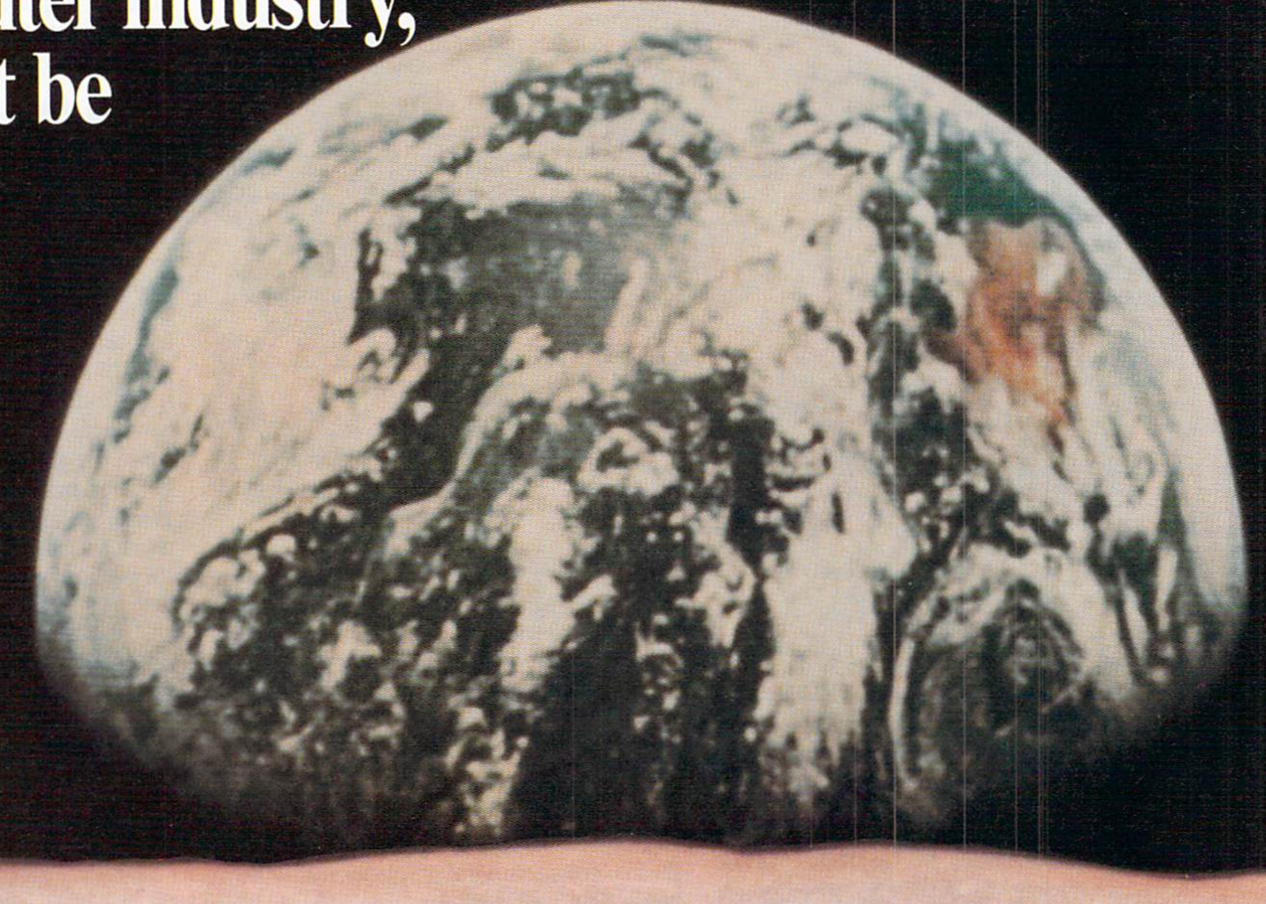
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20	Broderbund Software, 85	*21*	Innovative Technologies, 75
4	Chang Labs, 61	*8*	Island Graphics CIII
6	Cherry Lane, 73	*23*	Lattice Inc., 24
*	Commodore AMIGA CIV, 35, 39, 59	*9*	Lisp Co., 93
*	CW Communications, 94,	*31*	Manx Software, 79
		16	Metacomco, 80
		3	Mindscape, 5
		15	Software Group, 41
		18	Tardis Inc., 12, 13
		5	Tecmar Inc. CII, 1
		33	The 64 Store, 84

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White-Collar Amiga—The Amiga is ideally suited for the office, and this article explores some of the ways in which the Amiga can be used in the business environment.

Telecommunications—An introduction to telecommunications for Amiga users, with a special focus on the office.

Behind the Scenes at Commodore-Amiga—A look at the company, the people and the ideas that went into making the Amiga computer what it is today.

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4 9 14 19 24	29 34 39 44 49	54 59 64 69 74	79 84 89 94 99
5 10 15 20 25	30 35 40 45 50	55 60 65 70 75	80 85 90 95 100
101 106 111 116 121	126 131 136 141 146	151 156 161 166 171	176 181 186 191 196
102 107 112 117 122	127 132 137 142 147	152 157 162 167 172	177 182 187 192 197
103 108 113 118 123	128 133 138 143 148	153 158 163 168 173	178 183 188 193 198
104 109 114 119 124	129 134 139 144 149	154 159 164 169 174	179 184 189 194 199
105 110 115 120 125	130 135 140 145 150	155 160 165 170 175	180 185 190 195 200
201 206 211 216 221	226 231 236 241 246	251 256 261 266 271	276 281 286 291 296
202 207 212 217 222	227 232 237 242 247	252 257 262 267 272	277 282 287 292 297
203 208 213 218 223	228 233 238 243 248	253 258 263 268 273	278 283 288 293 298
204 209 214 219 224	229 234 239 244 249	254 259 264 269 274	279 284 289 294 299
205 210 215 220 225	230 235 240 245 250	255 260 265 270 275	280 285 290 295 300
301 306 311 316 321	326 331 336 341 346	351 356 361 366 371	376 381 386 391 396
302 307 312 317 322	327 332 337 342 347	352 357 362 367 372	377 382 387 392 397
303 308 313 318 323	328 333 338 343 348	353 358 363 368 373	378 383 388 393 398
304 309 314 319 324	329 334 339 344 349	354 359 364 369 374	379 384 389 394 399
305 310 315 320 325	330 335 340 345 350	355 360 365 370 375	380 385 390 395 400
401 406 411 416 421	426 431 436 441 446	451 456 461 466 471	476 481 486 491 496
402 407 412 417 422	427 432 437 442 447	452 457 462 467 472	477 482 487 492 497
403 408 413 418 423	428 433 438 443 448	453 458 463 468 473	478 483 488 493 498
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4 9 14 19 24	29 34 39 44 49	54 59 64 69 74	79 84 89 94 99
5 10 15 20 25	30 35 40 45 50	55 60 65 70 75	80 85 90 95 100
101 106 111 116 121	126 131 136 141 146	151 156 161 166 171	176 181 186 191 196
102 107 112 117 122	127 132 137 142 147	152 157 162 167 172	177 182 187 192 197
103 108 113 118 123	128 133 138 143 148	153 158 163 168 173	178 183 188 193 198
104 109 114 119 124	129 134 139 144 149	154 159 164 169 174	179 184 189 194 199
105 110 115 120 125	130 135 140 145 150	155 160 165 170 175	180 185 190 195 200
201 206 211 216 221	226 231 236 241 246	251 256 261 266 271	276 281 286 291 296
202 207 212 217 222	227 232 237 242 247	252 257 262 267 272	277 282 287 292 297
203 208 213 218 223	228 233 238 243 248	253 258 263 268 273	278 283 288 293 298
204 209 214 219 224	229 234 239 244 249	254 259 264 269 274	279 284 289 294 299
205 210 215 220 225	230 235 240 245 250	255 260 265 270 275	280 285 290 295 300
301 306 311 316 321	326 331 336 341 346	351 356 361 366 371	376 381 386 391 396
302 307 312 317 322	327 332 337 342 347	352 357 362 367 372	377 382 387 392 397
303 308 313 318 323	328 333 338 343 348	353 358 363 368 373	378 383 388 393 398
304 309 314 319 324	329 334 339 344 349	354 359 364 369 374	379 384 389 394 399
305 310 315 320 325	330 335 340 345 350	355 360 365 370 375	380 385 390 395 400
401 406 411 416 421	426 431 436 441 446	451 456 461 466 471	476 481 486 491 496
402 407 412 417 422	427 432 437 442 447	452 457 462 467 472	477 482 487 492 497
403 408 413 418 423	428 433 438 443 448	453 458 463 468 473	478 483 488 493 498
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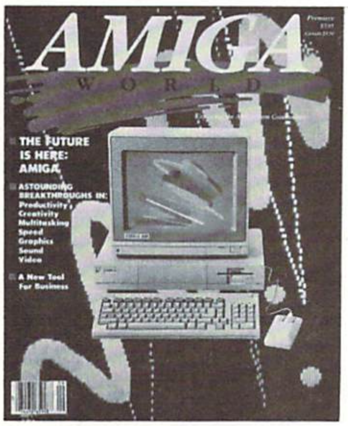
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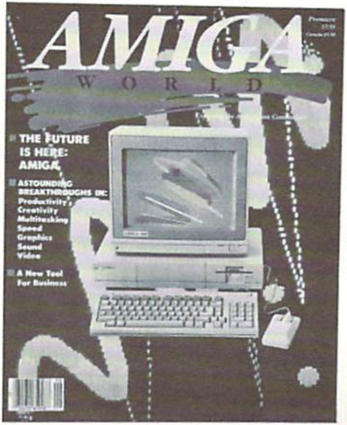
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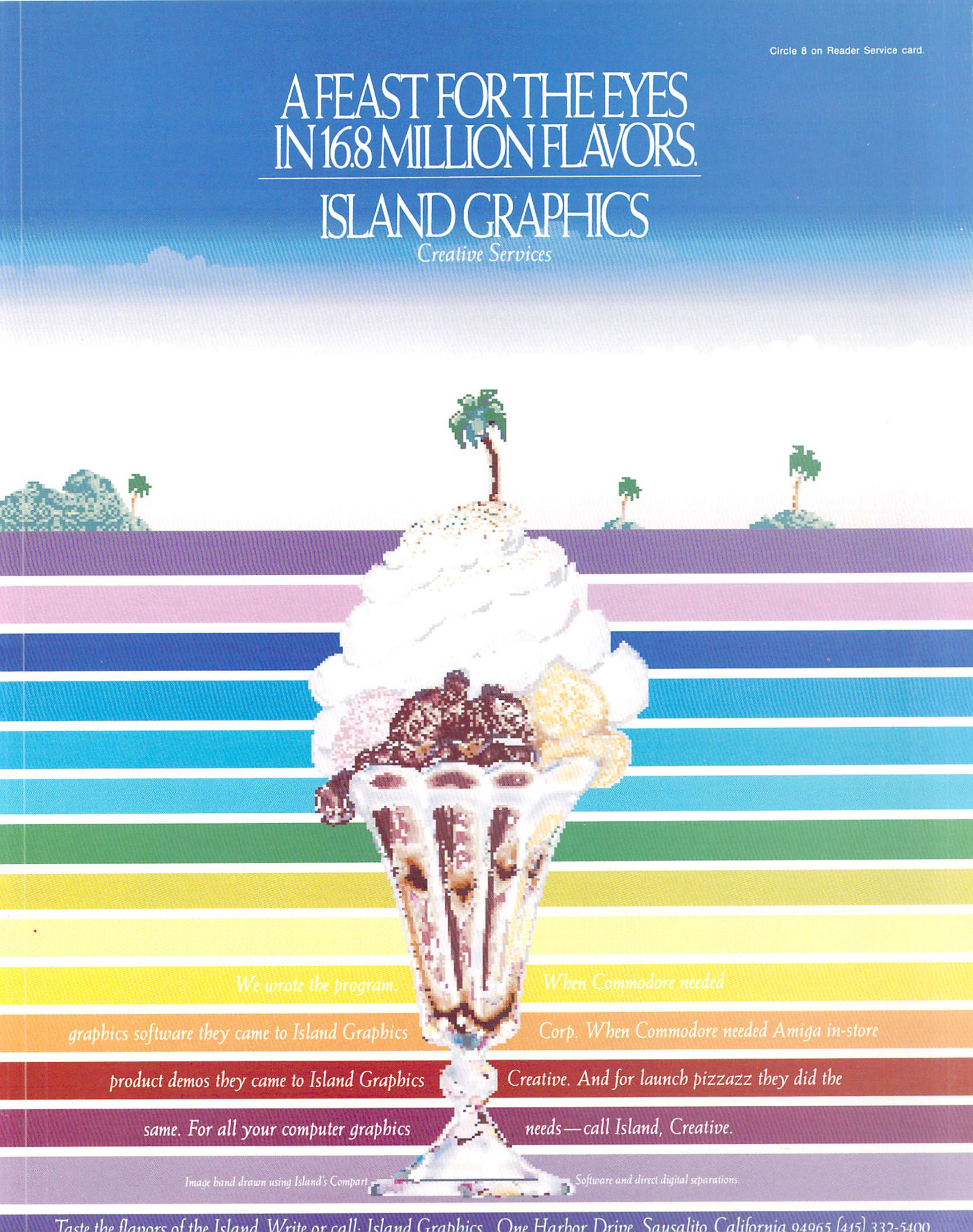
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